



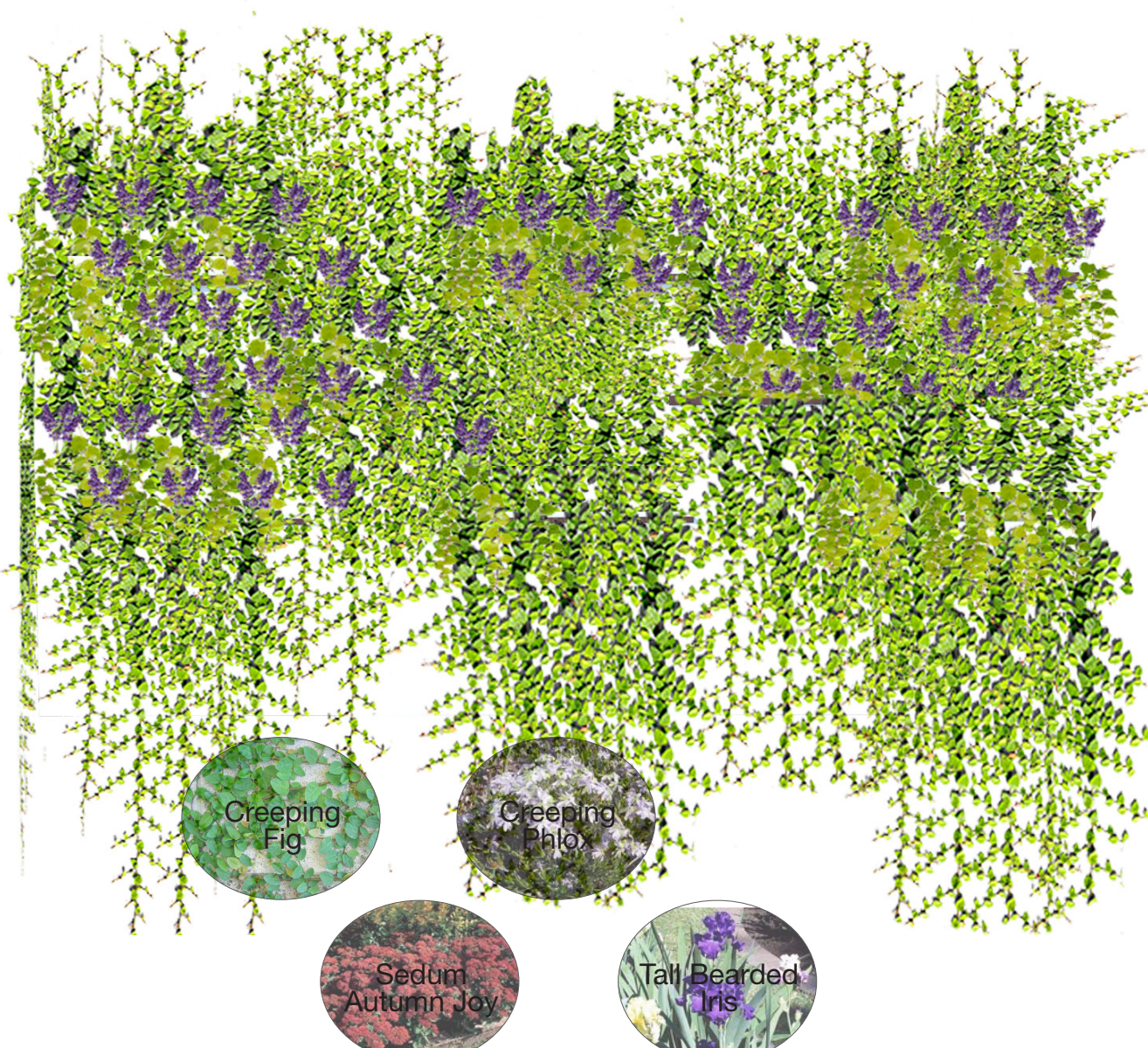
2115 BROAD

EXPANDABLE RESERVOIR/GREEN WALL SYSTEM

Planters provide support and the soil for a variety of plants

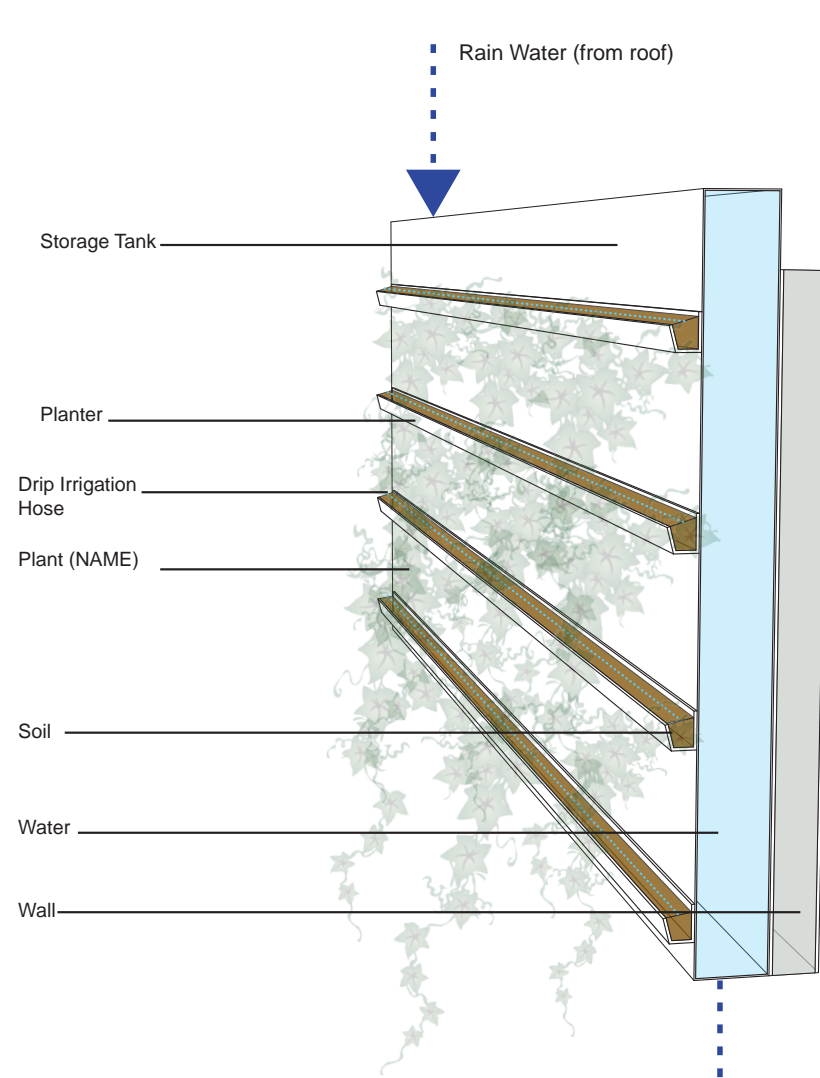
Low impact design allows for easy expansion

The chosen perennials are excellent choices for low-water gardening, and their hardiness makes them the perfect choice for a beautiful and low maintenance green wall.

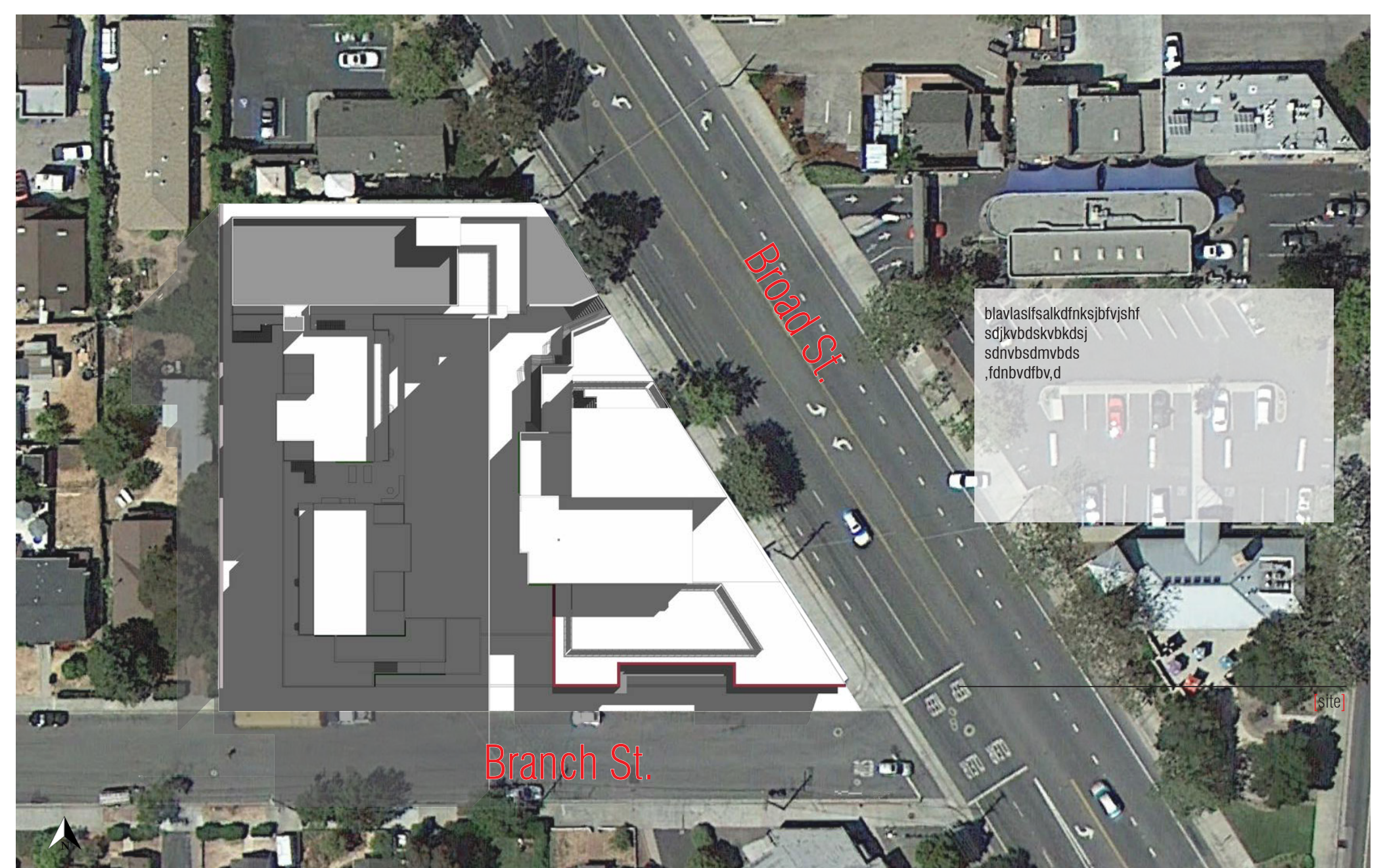


Drip irrigation system that adjust to specific water levels and plant needs

Low profile reservoir



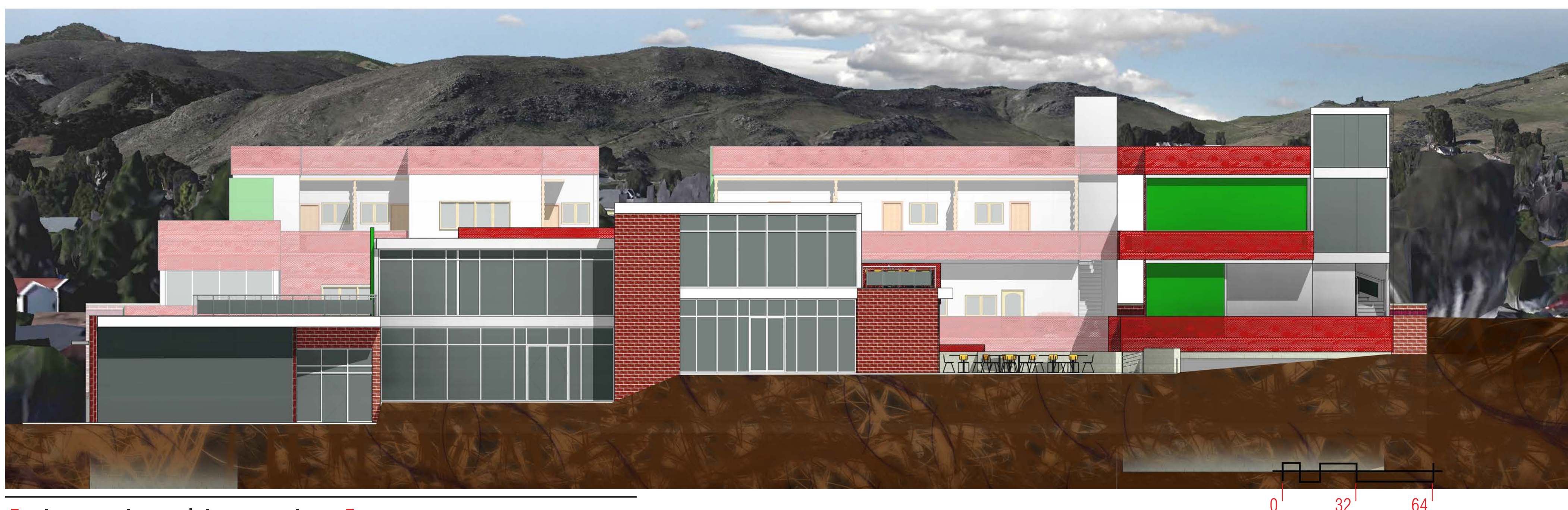
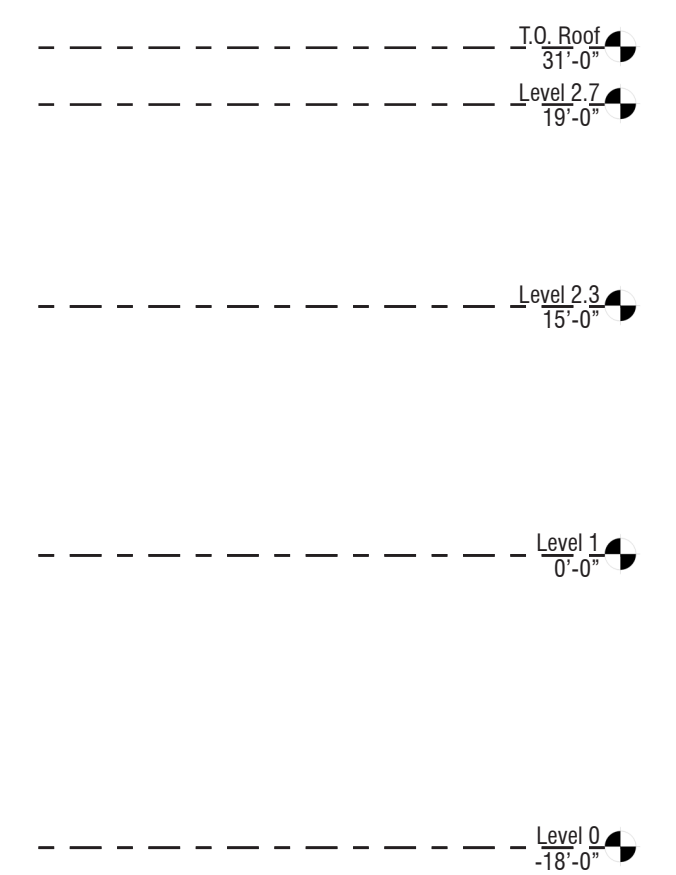
2115 Broad St. is located in the Railroad District of San Luis Obispo, just a minutes from Downtown. Its proximity will provide the occupants and neighboring community relative close access to its proposed program. Part of our goals for the project was to provide as large amount of housing without sacrificing open space and the quality of living, our proposed design consists



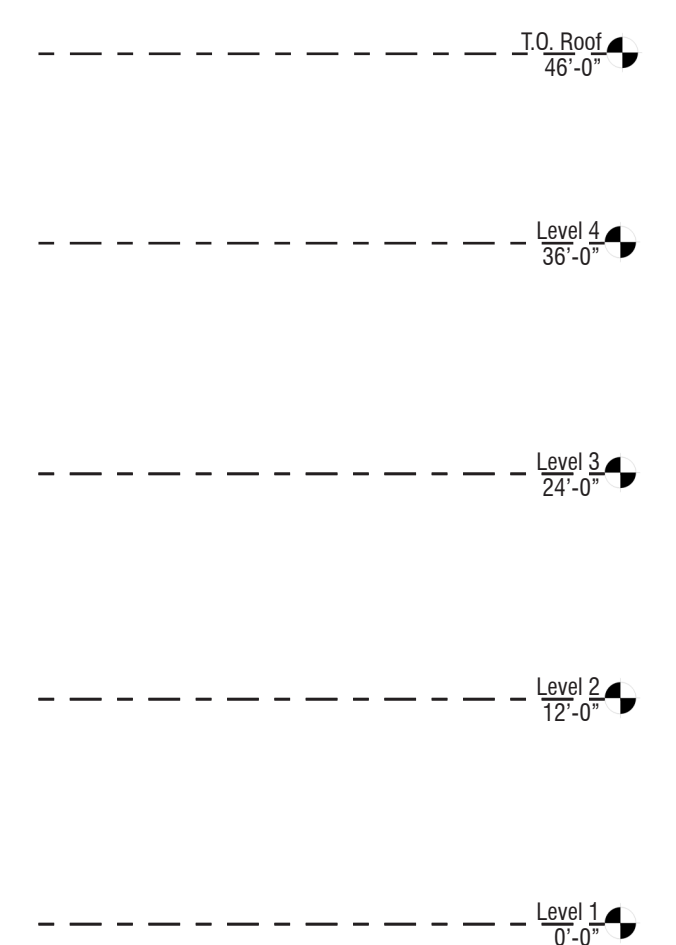
of a total of 21 units with a density value of 23.8. The proposed design also includes 2 large offices with a shared lobby area, 3 restaurants/café, a small grocery store serving the neighborhood, as well as shared spaces for the residents in which events and other community activities could take place.



[elevation | south]



[elevation | broad st]





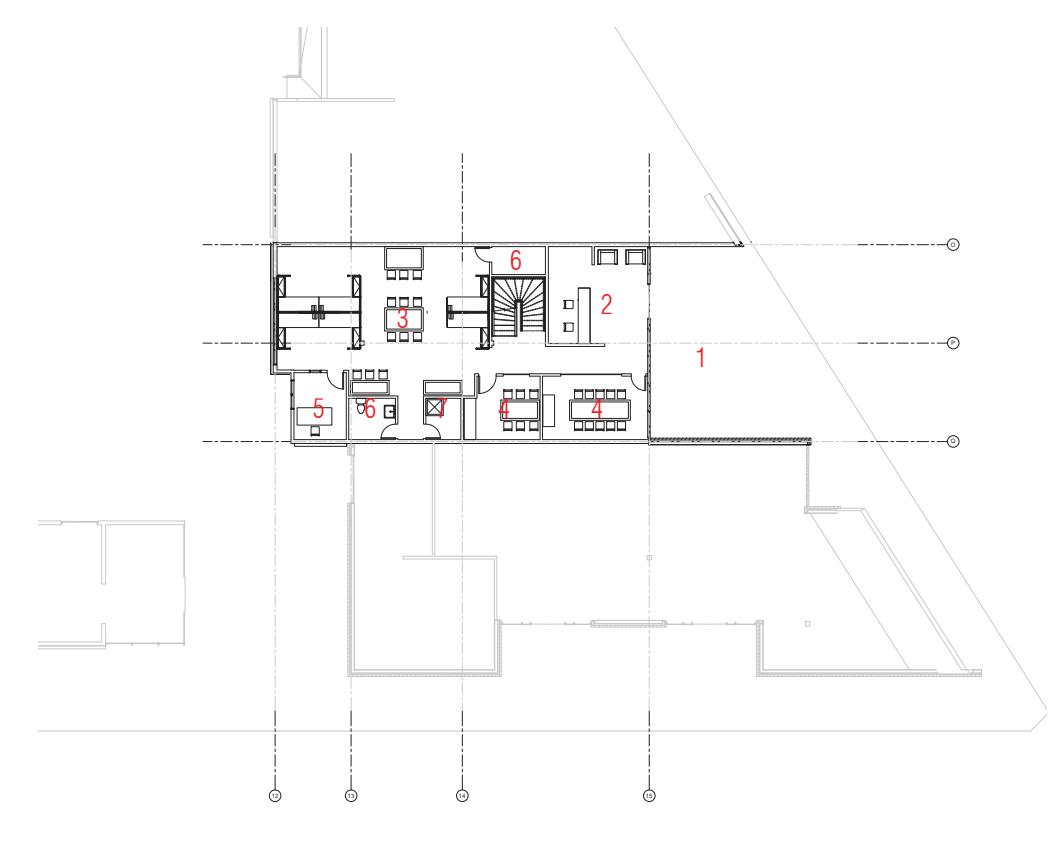
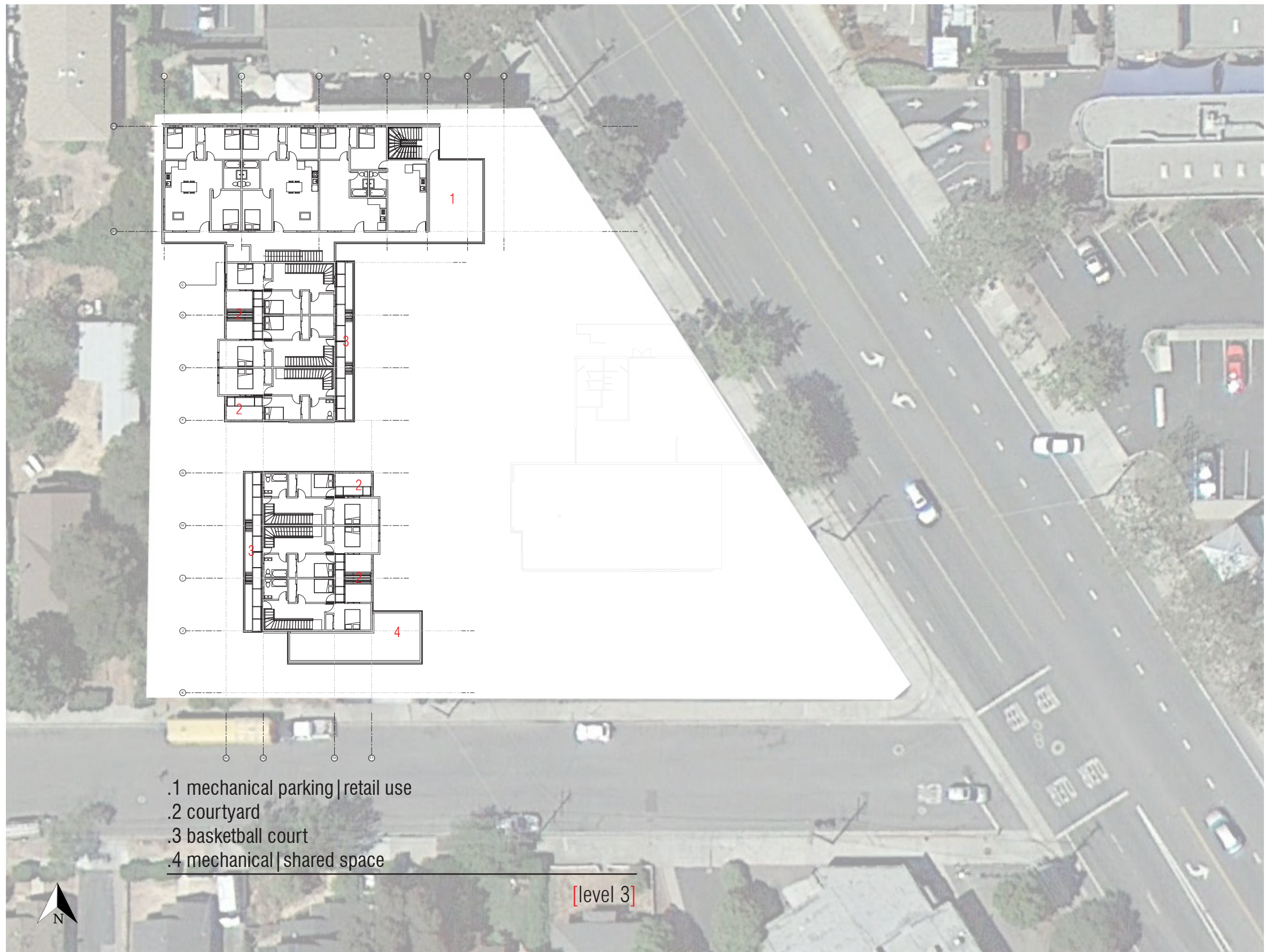
[elevation | courtyard east]



[elevation | north]

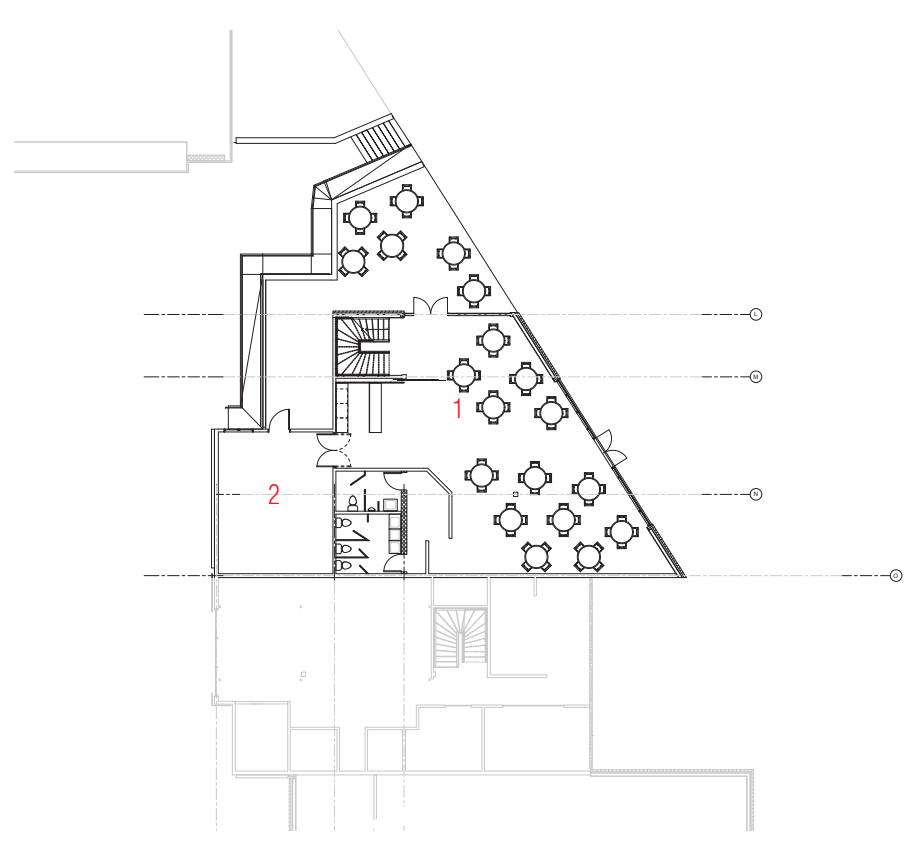


[elevation | west]



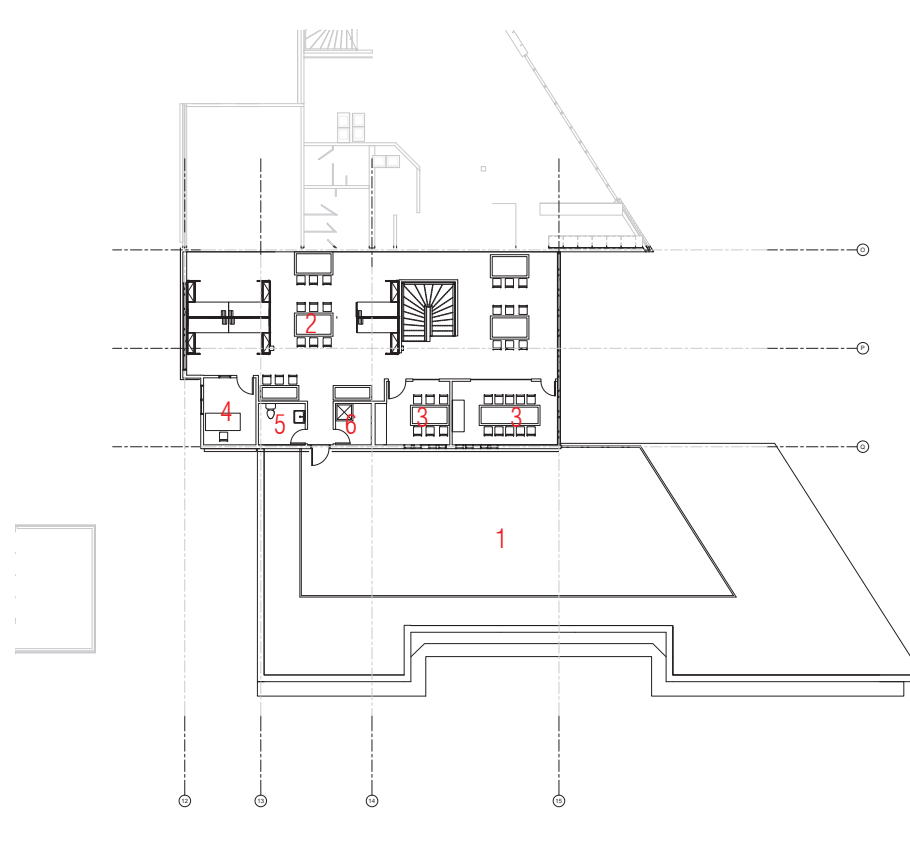
- .1 garden
- .2 lobby
- .3 office space
- .4 conference room
- .5 private office
- .6 restroom
- .7 shower

[level 1.3]



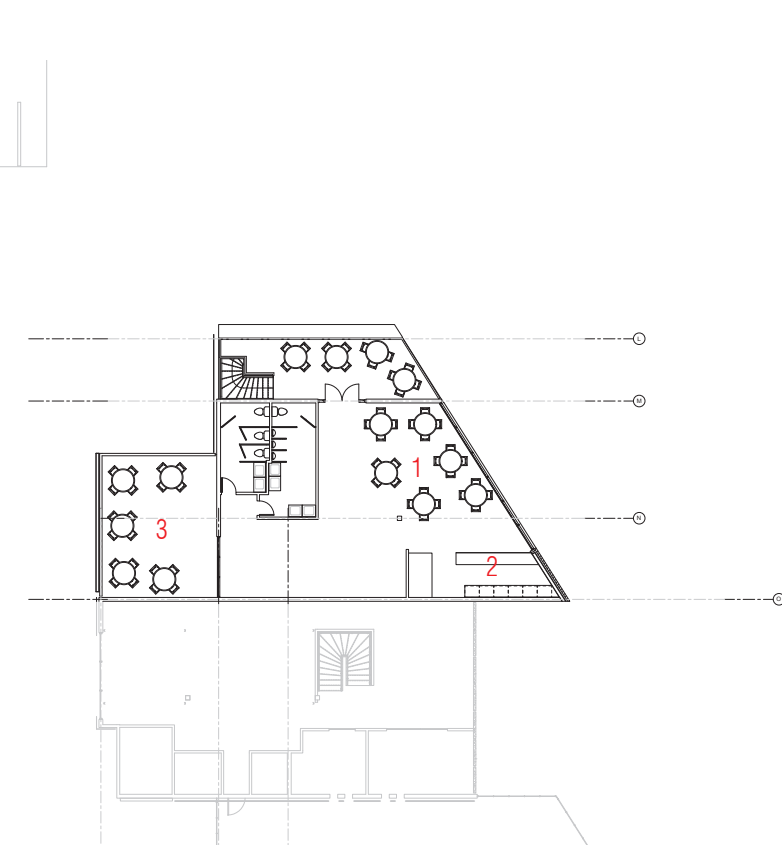
- .1 restaurant/cafe
- .2 back of house

[level 1.7]



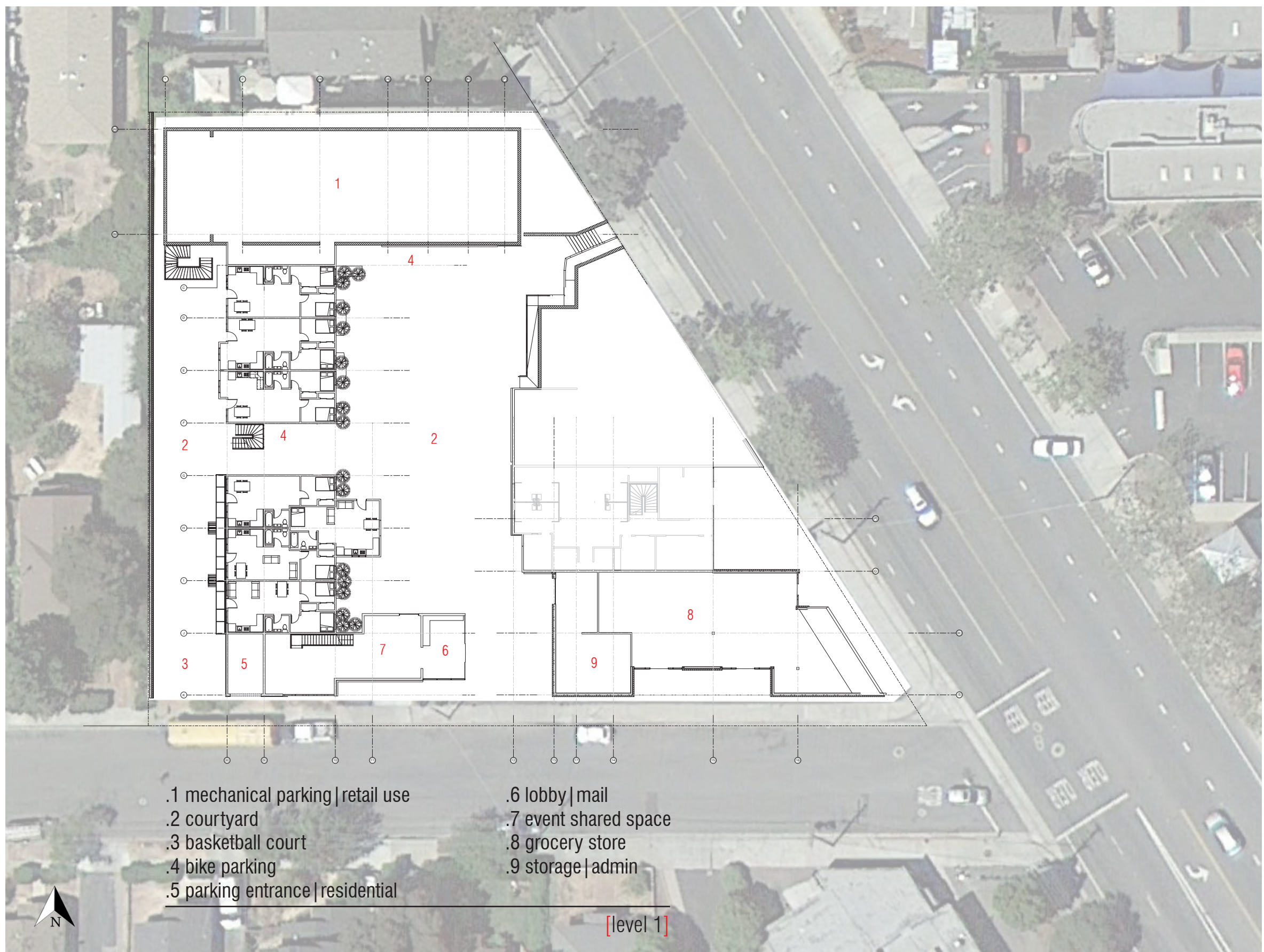
- .1 terrace
- .2 office space
- .3 conference room
- .4 private office
- .5 restroom
- .6 shower

[level 2.3]



- .1 cafe
- .2 drink prep
- .3 terrace

[level 2.7]



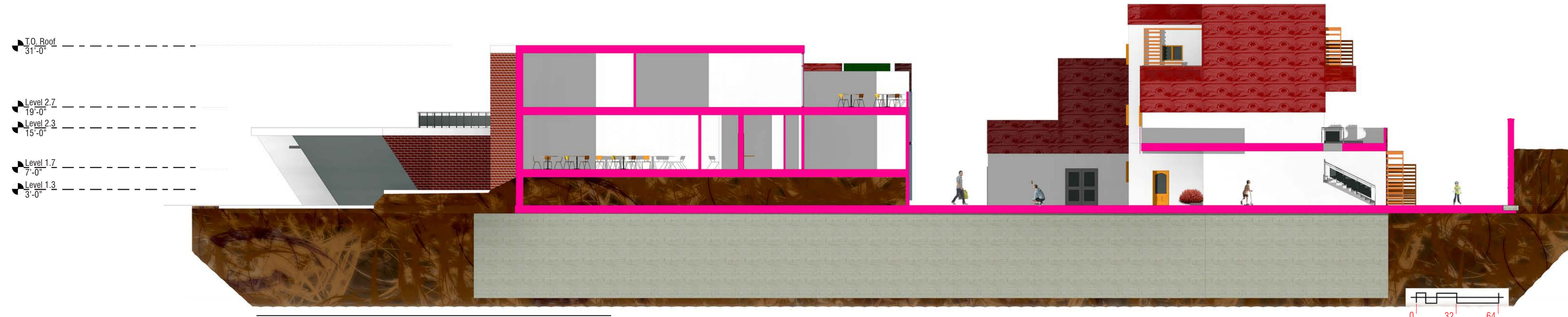
- .1 mechanical parking | retail use
- .2 courtyard
- .3 basketball court
- .4 bike parking
- .5 parking entrance | residential
- .6 lobby | mail
- .7 event shared space
- .8 grocery store
- .9 storage | admin

[level 1]

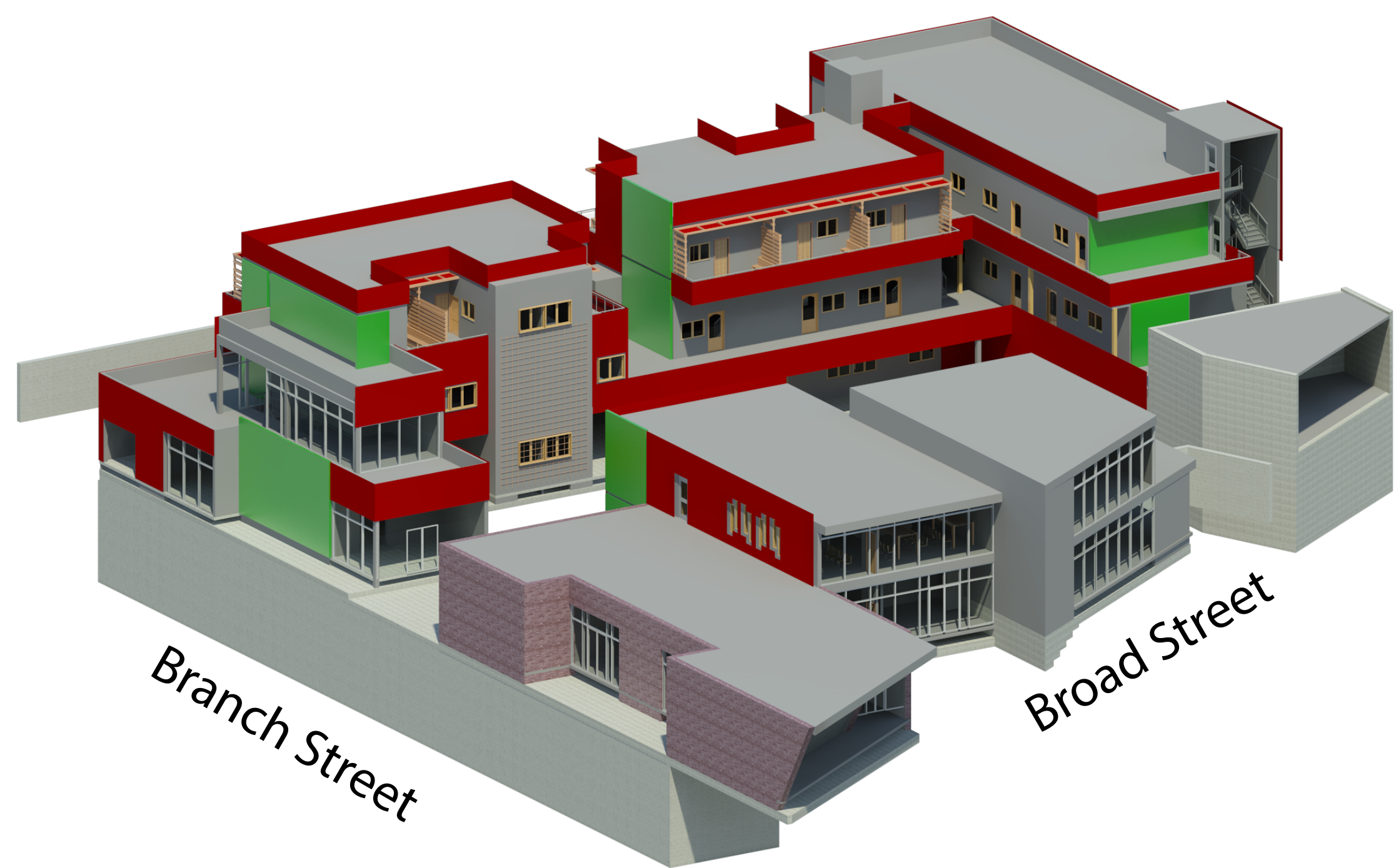
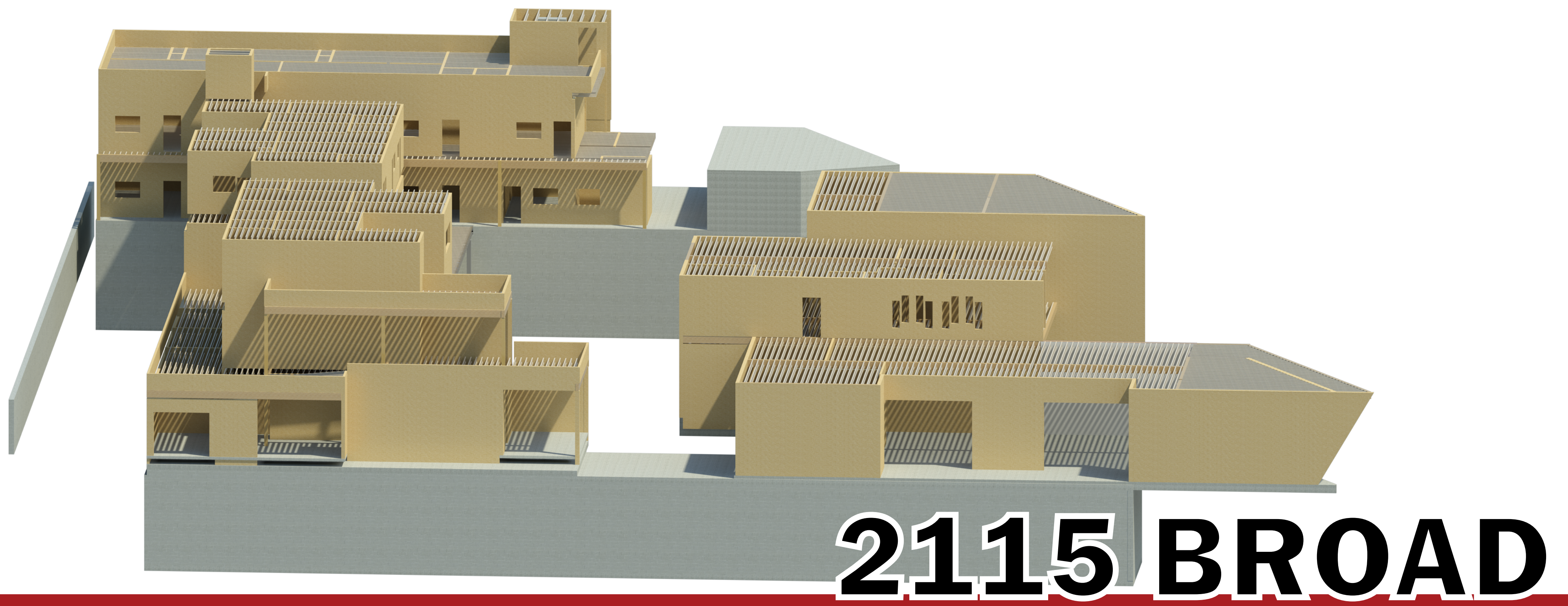


- .1 parking entrance | retail use
- .2 terrace
- .3 event shared space
- .4 outdoor cooking area

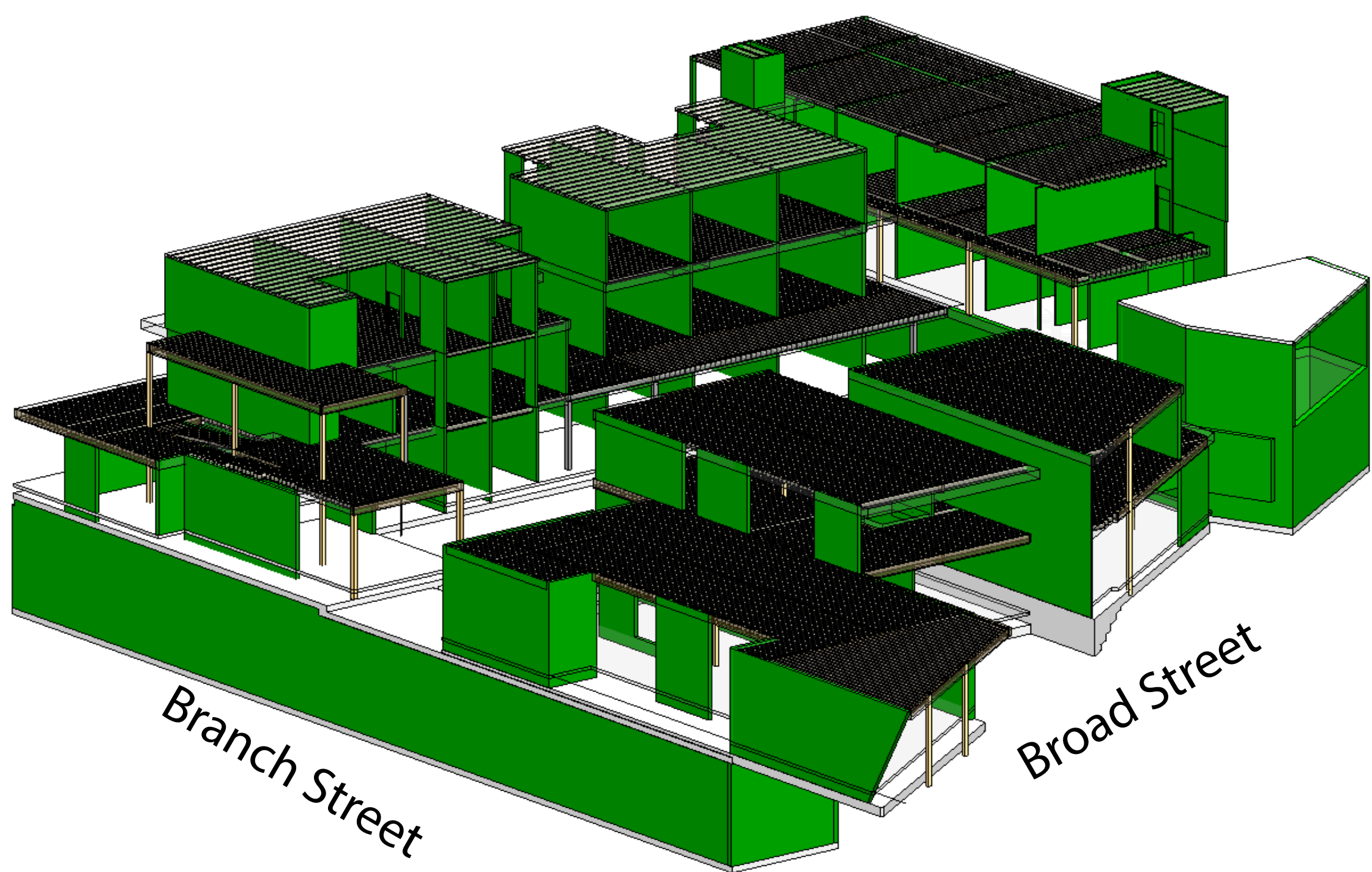
[level 2]



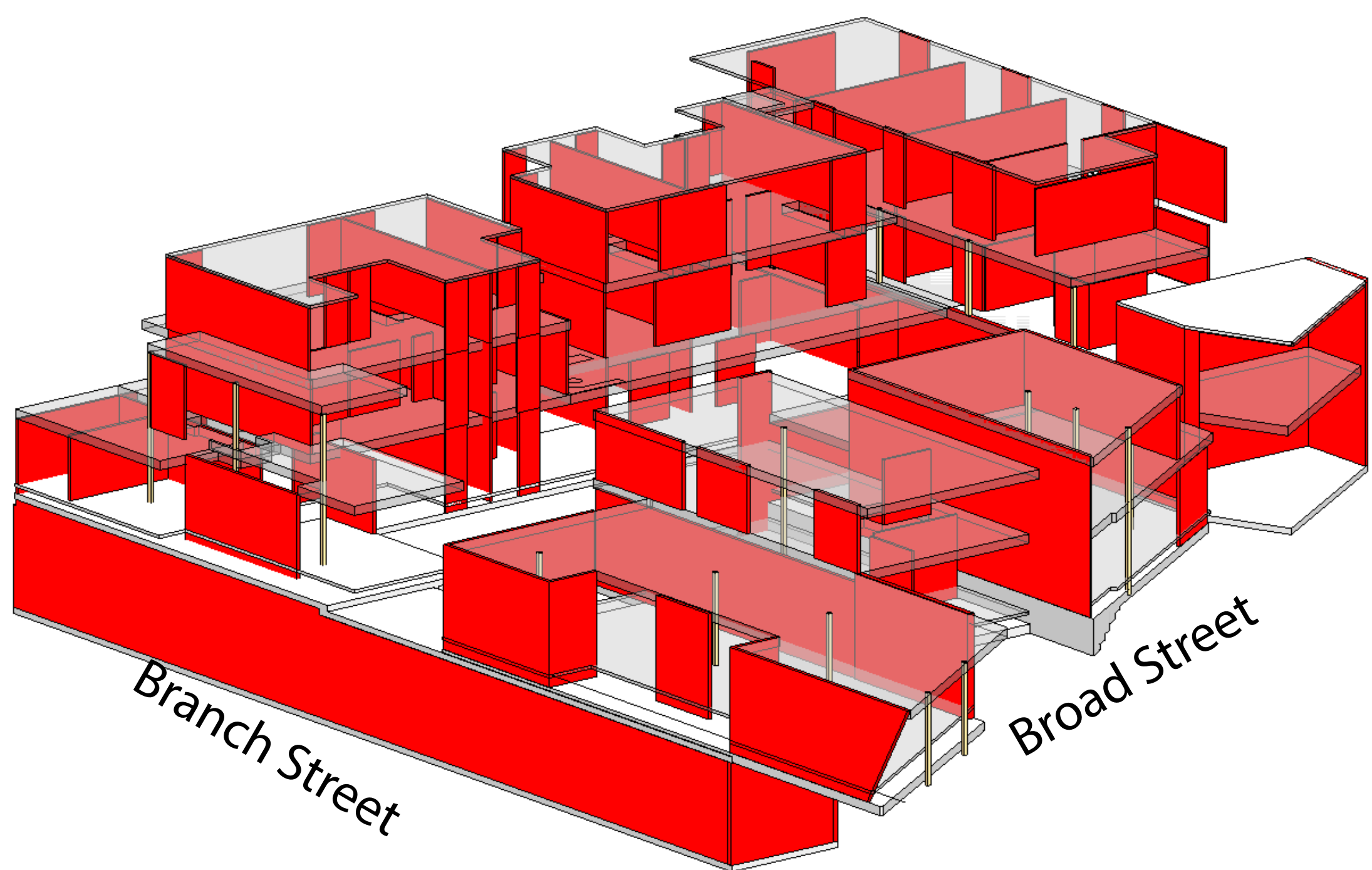
[section | courtyard south]



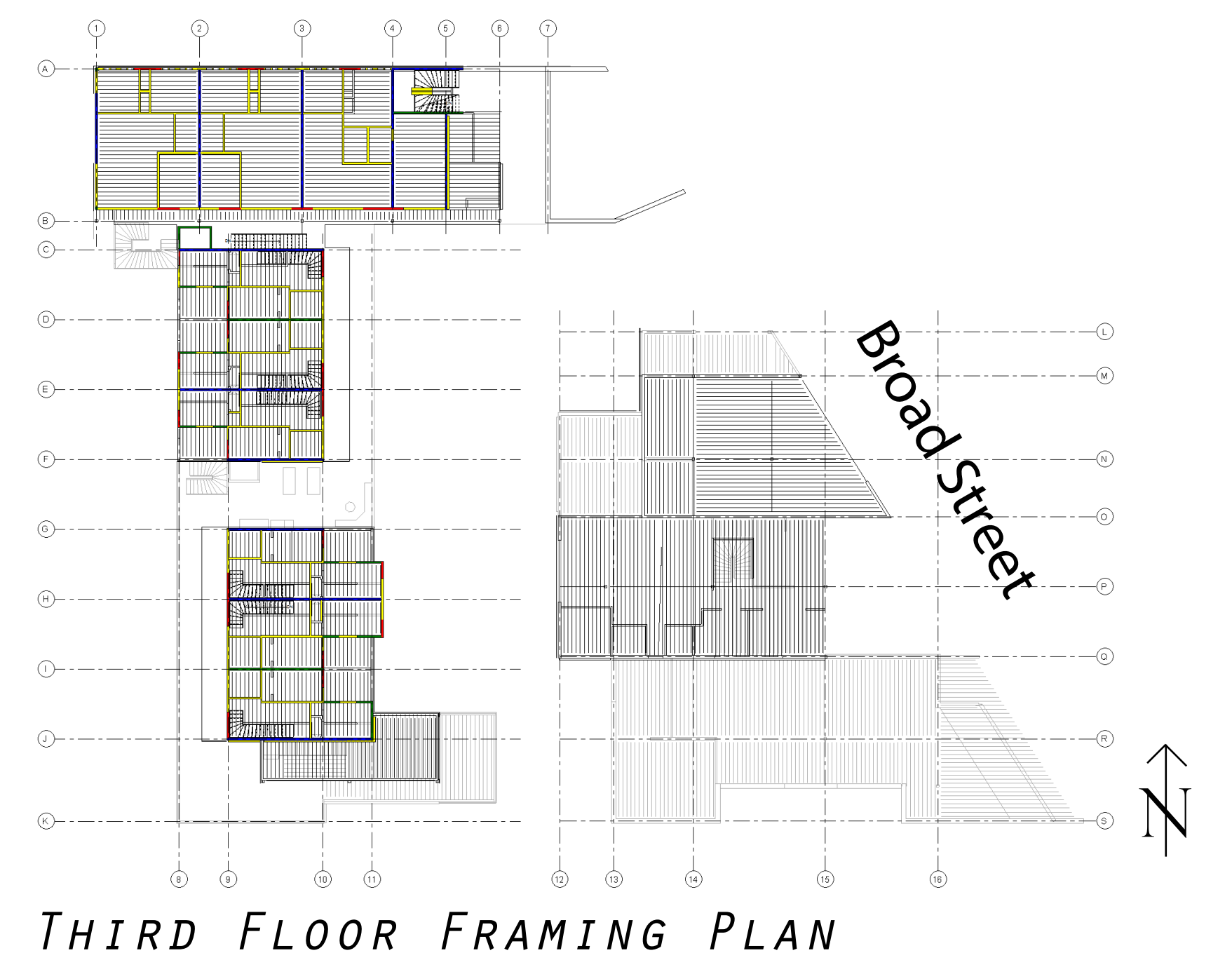
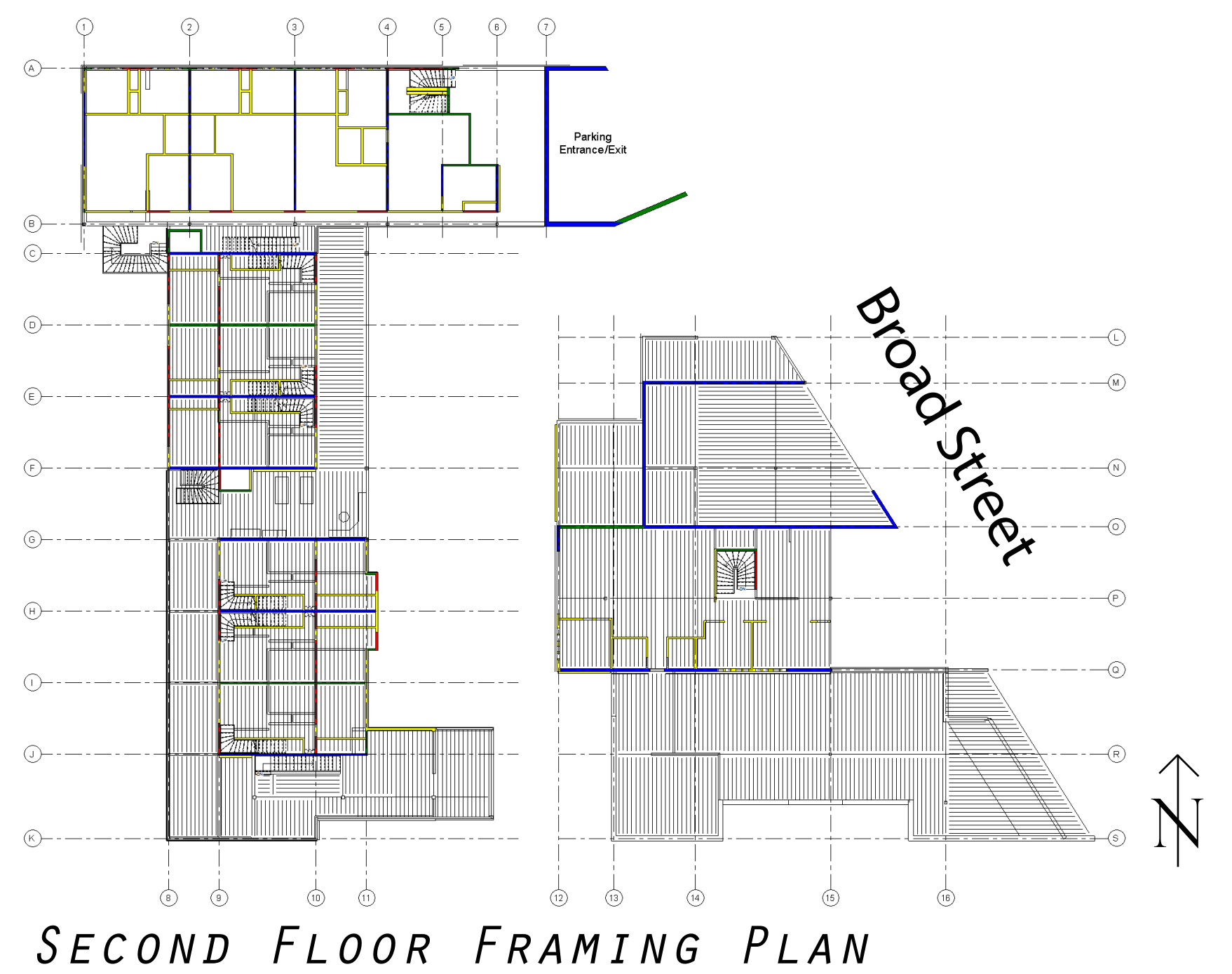
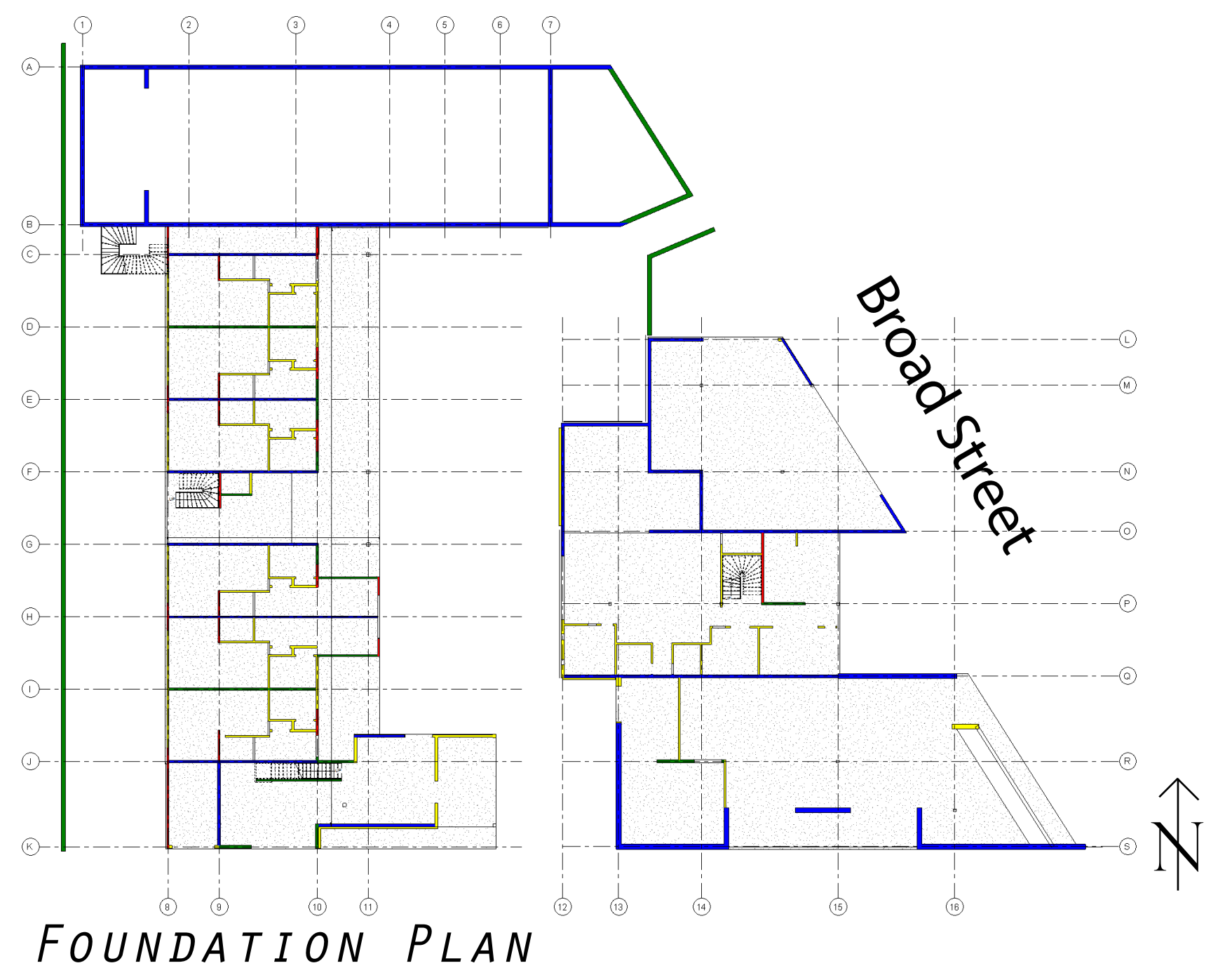
ARCHITECTURAL MODEL



3D GRAVITY SYSTEM

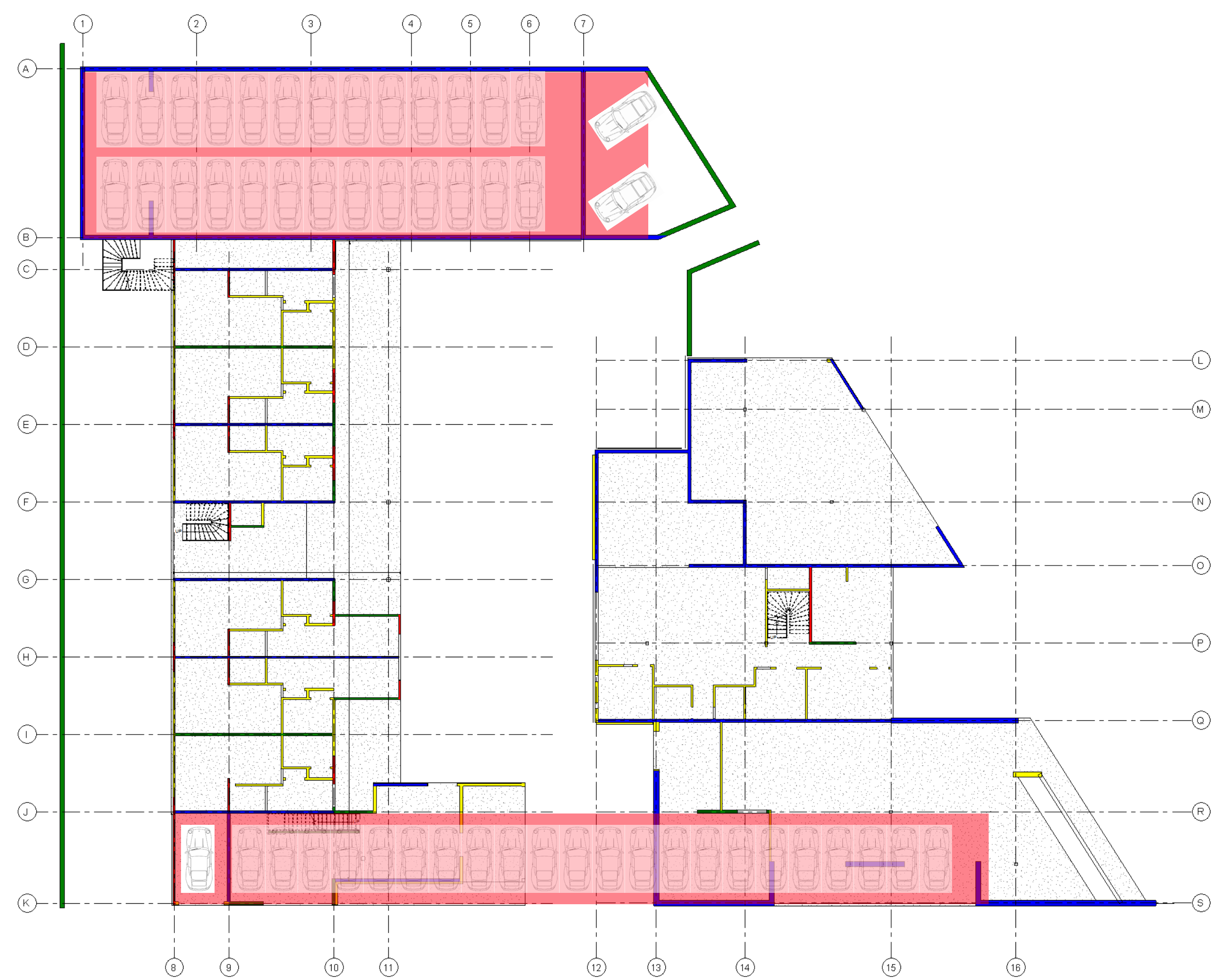


3D LATERAL SYSTEM



- - Load Bearing Only
- - Combined Bearing and Shear Walls
- - Shear Walls Only
- - Partition Walls

Parking & Foundation



PARKING CONFIGURATION

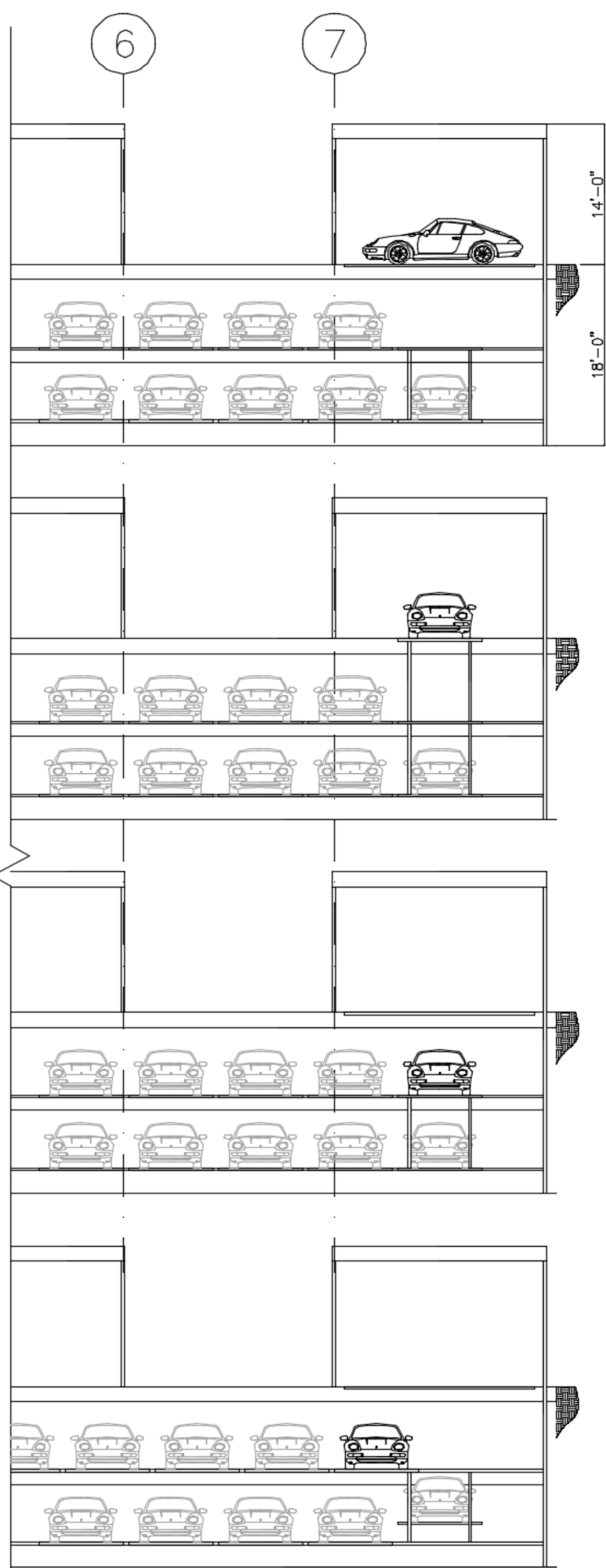
STEP

1

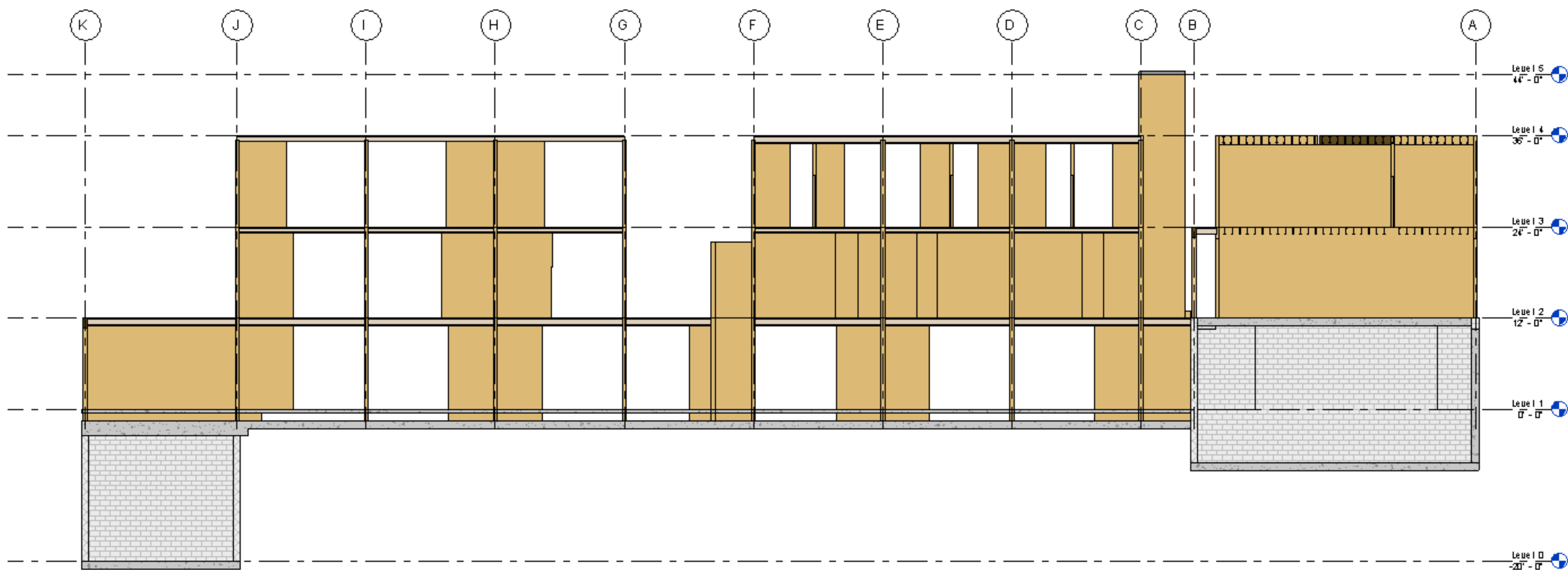
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3

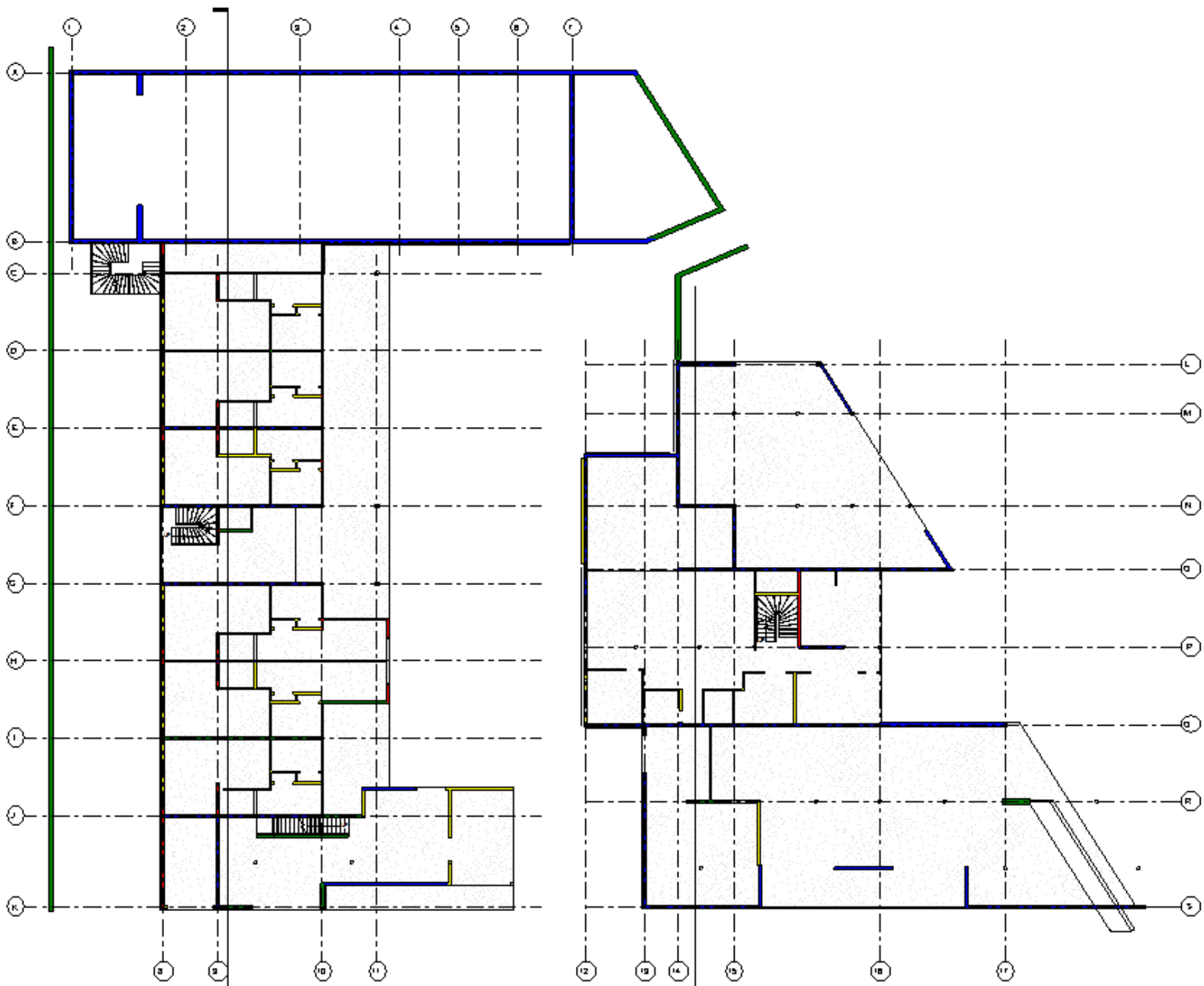
4



PARKING SECTION
STEP-BY-STEP

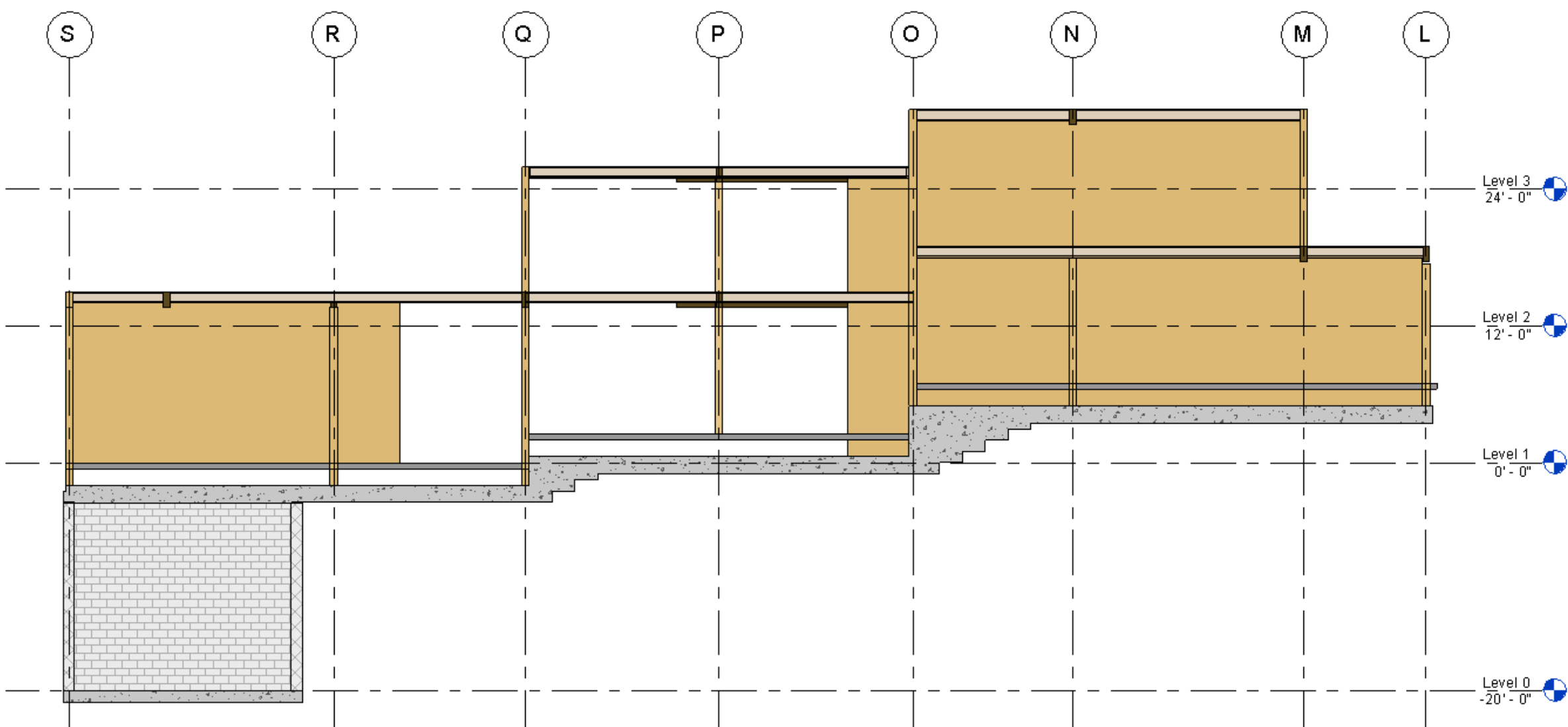


SECTION 1



Section 1

Section 2

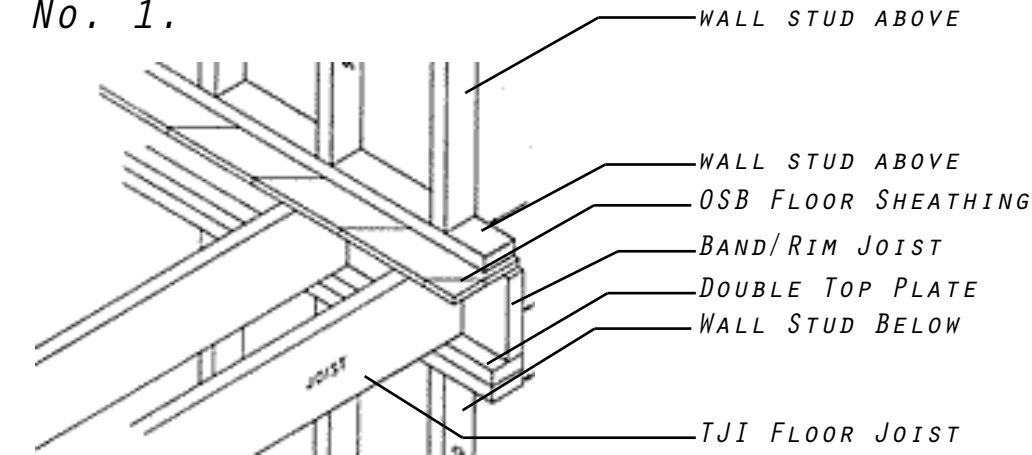


SECTION 2

GRAVITY SYSTEM DESCRIPTION

RESIDENTIAL TIMBER CONSTRUCTION

- OSB STRUCTURAL 1 FLOOR SHEATHING SUPPORTED BY TJI JOIST
- 9.5"-16" DEEP TJI 360 JOIST
 - @ 24" C.C. SPACING ROOF
 - @ 12" C.C. SPACING GREEN ROOF
 - @ 12" C.C. SPACING FLOOR
- PROVIDE WEB STIFFENERS FOR TJI JOISTS AT WALL CONNECTION.
- ALL JOISTS SUPPORTED BY LOAD-BEARING WALLS AND PSL BEAMS.
- LOAD BEARING WALLS TO BE COMPRISED OF 2X6 SAWN LUMBER STUDS @ 16" C.C. SPACING.
- 2X6 SAWN LUMBER FOR DOUBLE TOP PLATE AND SILL PLATE.
- PROVIDE PSL BELOW DISCONTINUOUS LOAD-BEARING WALLS.
- OSB WALL SHEATHING CONNECTED TO WALL STUDS.
- ALL SAWN LUMBER TO BE DOUGLASS FIR No. 1.



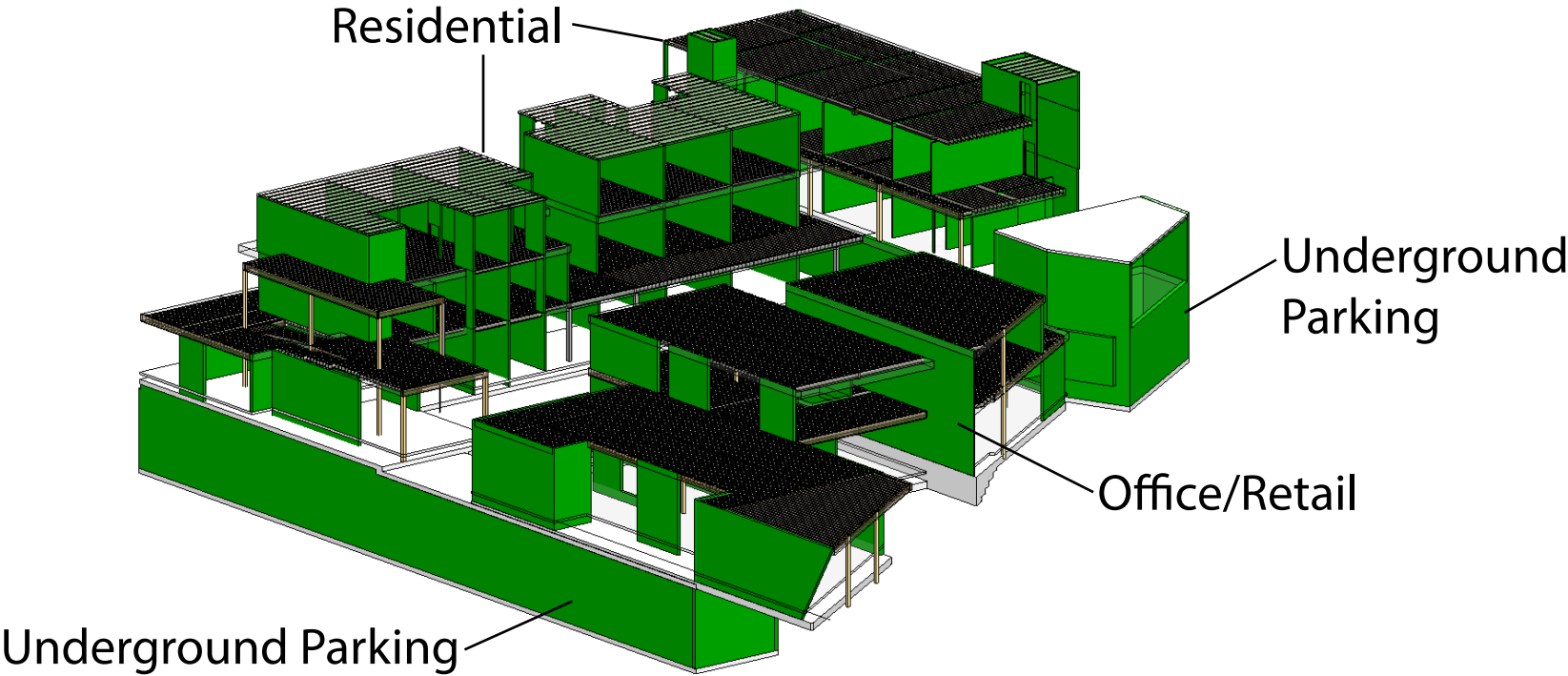
TJI JOIST TO BEARING WALL

UNDERGROUND PARKING CONCRETE CONSTRUCTION

- USE 4KSI NORMAL WEIGHT CONCRETE
- PROVIDE GRADE 60 REBAR FOR TENSION REINFORCEMENT.
- 4"-6" CONCRETE SLAB ABOVE MECHANICAL PARKING.
- 18"-36" DEEP CONCRETE BEAMS SUPPORTING SLAB.
- 12" THICK CONCRETE WALLS SUPPORTING SLAB, BEAMS, AND RESIDENTIAL TIMBER FRAMING ABOVE.
- WALLS TO BE CONSIDERED RETAINING AND BEARING WALLS.
- MONOLITHIC CONCRETE SYSTEM.
- ANCHOR TIMBER WALLS ABOVE TO CONCRETE WALLS BELOW.

OFFICE/RETAIL TIMBER CONSTRUCTION

- OSB STRUCTURAL 1 FLOOR SHEATHING SUPPORTED BY TJI JOIST.
- 9.5"-16" DEEP TJI 360 JOIST
 - @ 24" C.C. SPACING ROOF
 - @ 12" C.C. SPACING GREEN ROOF
 - @ 12" C.C. SPACING FLOOR
- JOISTS SUPPORTED BY BOTH PSL BEAMS AND LOAD-BEARING WALLS.
- PROVIDE INTERIOR TIMBER COLUMNS TO SUPPORT PSL BEAMS.
- PSL BEAMS TO BE:
 - 7" THICK
 - 11 7/8" - 18" DEEP
- BEAM-TO-COLUMN CONNECTION VIA SIMPSON STRONG TIE COLUMN CAP.
- LOAD BEARING WALLS SAME AS RESIDENTIAL.



LATERAL SYSTEM DESCRIPTION

RESIDENTIAL TIMBER CONSTRUCTION

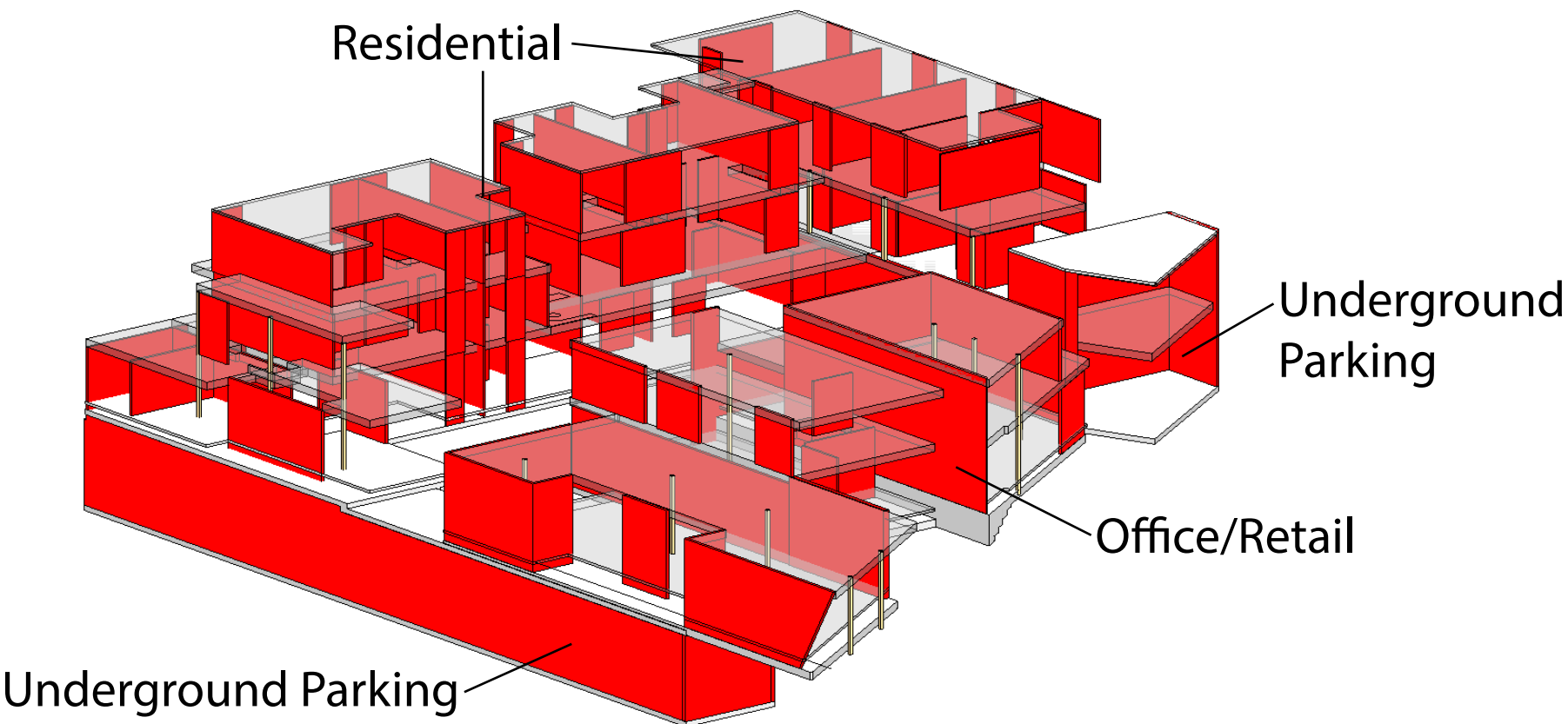
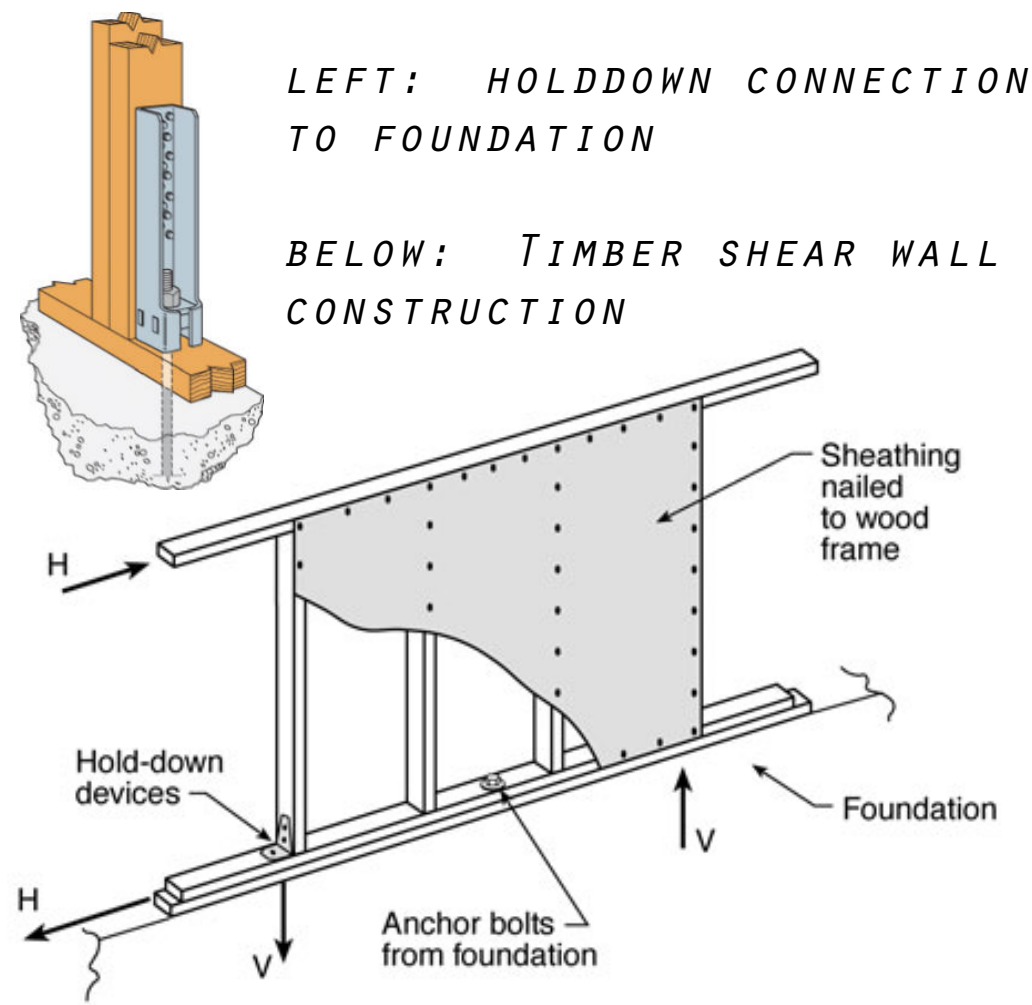
- PROVIDE SIMPSON HOLD-DOWNS WITHIN SHEAR WALLS FOR LATERAL REINFORCEMENT.
- CONNECT 1/2" OSB SHEATHING TO WALL STUDS USING 8D NAILS @ 2"-6" SPACING AT PANEL EDGES.
- CONNECT 3/4" OSB SHEATHING TO FLOOR JOISTS USING 8D NAILS @ 2"-6" SPACING AT PANEL EDGES.
- PROVIDE SIMPSON STRAPS AT COLLECTOR AND CHORD SPLICES.

UNDERGROUND PARKING CONCRETE CONSTRUCTION

- USE 4KSI NORMAL WEIGHT CONCRETE
- PROVIDE GRADE 60 REBAR FOR TENSION REINFORCEMENT.
- CONCRETE SHEAR WALLS AROUND THE PERIMETER OF UNDERGROUND PARKING.
- PROVIDE HOLD DOWNS TO CONNECT TIMBER SHEAR WALLS ABOVE TO CONCRETE SHEAR WALLS BELOW.

OFFICE/RETAIL TIMBER CONSTRUCTION

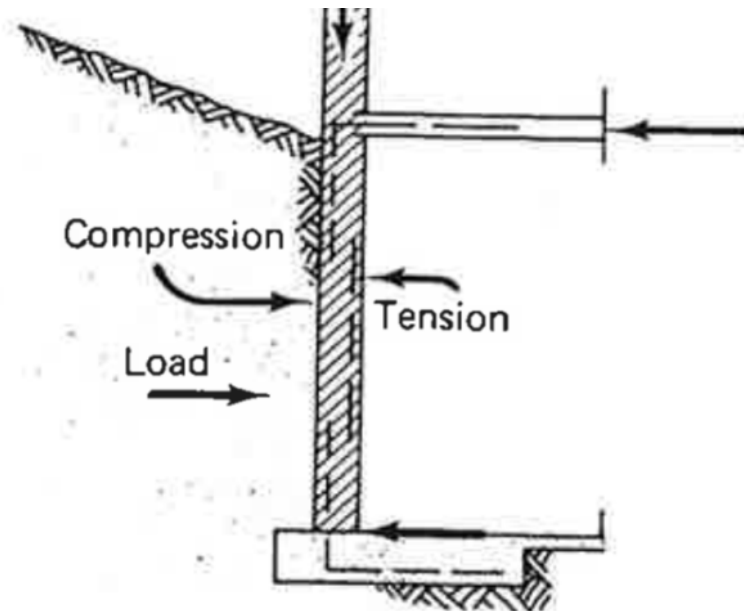
- USE 4KSI NORMAL WEIGHT CONCRETE AND 60KSI REBAR FOR CONCRETE SHEAR WALLS ON STOREFRONT FACE OF BUILDING.
- PROVIDE 2X-4X LEDGER TO ALLOW DIAPHRAGM CONNECTION TO CONCRETE SHEAR WALL.
- PROVIDE HOLDDOWNS TO CONNECT JOISTS OR BEAMS TO CONCRETE WALL THROUGH LEDGER.
- PROVIDE WEB STIFFENERS AT ANY TJI JOISTS ANCHORED WITH HOLDDOWNS.
- SEE RESIDENTIAL TIMBER FRAMING FOR OTHER TIMBER-RELATED DESCRIPTIONS



FOUNDATION SYSTEM DESCRIPTION

MAT SLAB FOUNDATION

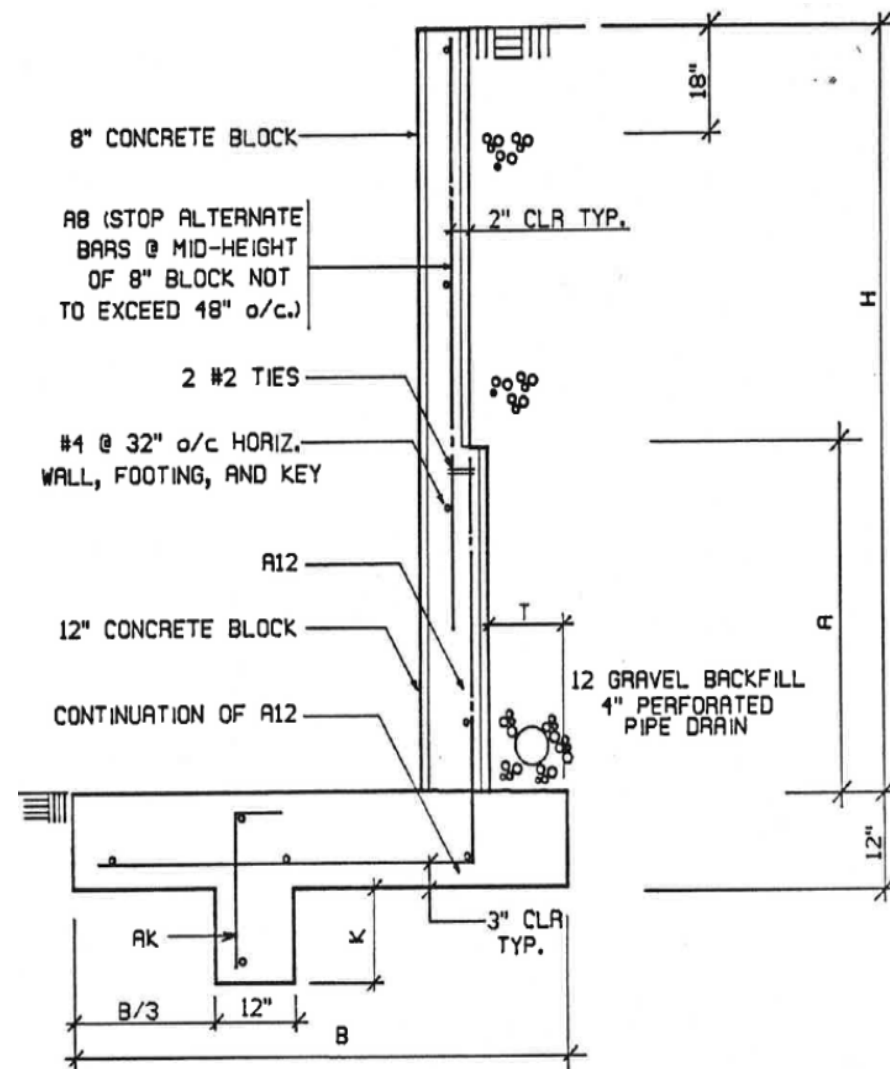
- PROVIDE AN ON-GRADE, SHALLOW MAT FOUNDATION FOR ALL STRUCTURES.
- FOUNDATION TO BE 3KSI NORMAL WEIGHT CONCRETE
- USE GRADE 60 GALVANIZED STEEL REINFORCEMENT.
- PROVIDE MINIMUM 1.5" COVER FROM REBAR TO CONCRETE FACE.
- FOUNDATION TO BE 24" THICK.
- PROVIDE VAPOR RETARDANT BENEATH MAT SLAB.
- PROVIDE 4" GRAVEL OVER 2" SAND BENEATH VAPOR RETARDANT.



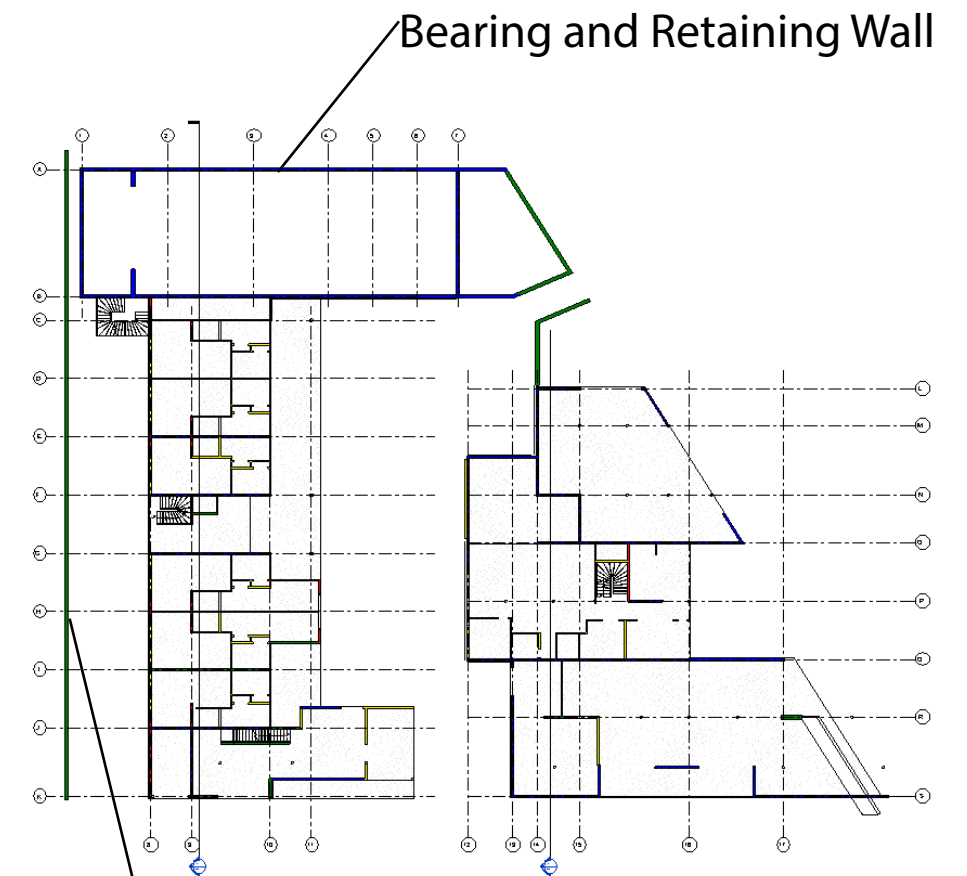
*BEARING AND RETAINING WALL
FOUNDATION*

RETAINING WALL FOUNDATION

- FOUNDATION TO BE 3KSI NORMAL WEIGHT CONCRETE
- USE GRADE 60 GALVANIZED STEEL REINFORCEMENT.
- PROVIDE MINIMUM 2" COVER FROM REBAR TO CONCRETE FACE.
- PROVIDE AN ON-GRADE, SHALLOW MAT FOUNDATION FOR ALL STRUCTURES.
- PROVIDE KEY POPOUT FOR INCREASED SHEAR CAPACITY.

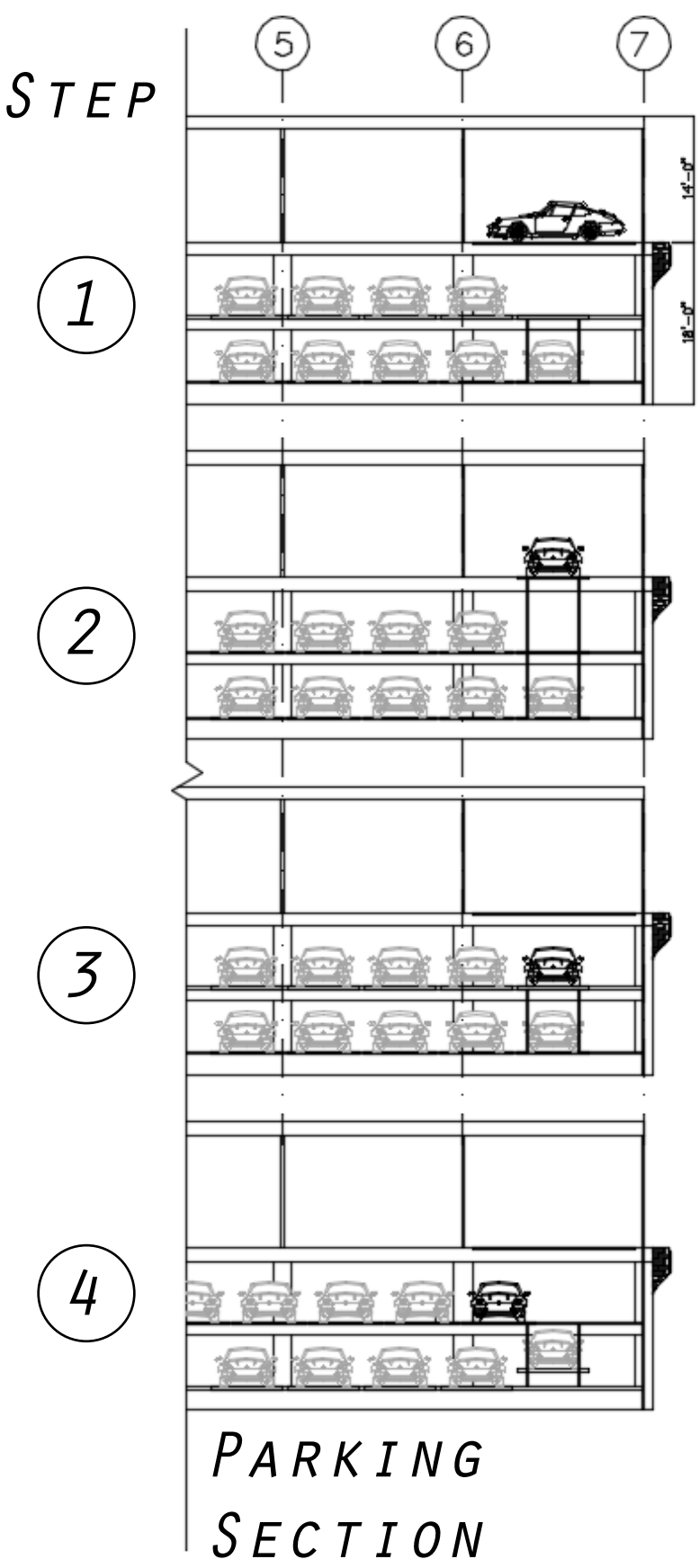


FREE STANDING RETAINING WALL
FOUNDATION WITH KEY FOR SHEAR



Free Standing Retaining Wall

MECHANICAL PARKING DESCRIPTION

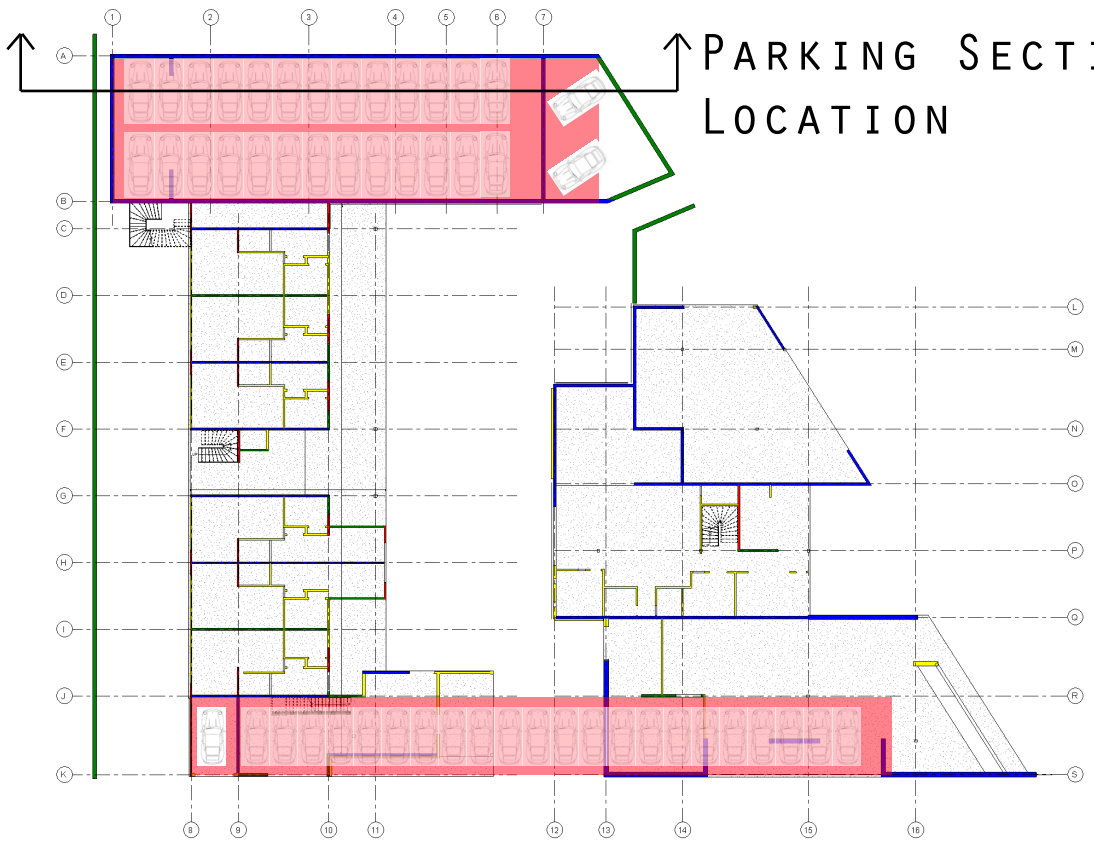


STOLZER AUTOMATIC PARKING UP PARKING SYSTEM:

- UNIVERSAL PARKING SYSTEM FOR PARKING UP TO 100 VEHICLES WITH 1 STORAGE AND RETRIEVAL UNIT
- THE PARKING PLACES CAN BE LOCATED EITHER IN A FREE STANDING STEEL RACK STRUCTURE OR IN A CONCRETE STRUCTURE WITH INTERMEDIATE SLABS.
- PER STOLZER AUTOMATIC PARKING UP PARKING SYSTEM REQUIREMENTS AND SITE CONDITIONS, CONCRETE STRUCTURE WITH INTERMEDIATE CONCRETE SLABS ARE MANDATORY.

EXPLANATION OF STEPS:

- STEP 1: CAR ENTERS CARPORT ONTO MECHANICAL ROTATING PLATE.
- STEP 2: ROTATING PLATE ROTATES.
- STEP 3: PLATE CARRYING CAR IS LOWERED ONTO CONVEYOR SYSTEM BELOW.
- STEP 4: ALL CARS ROTATE ON CONVEYOR SYSTEM TOGETHER TO ACCESS DEPARTING CAR.



GRAVITY SYSTEM SELECTION

RESIDENTIAL TIMBER CONSTRUCTION

*BUILDING PROGRAM:

- MAX SPAN 25’
- MAX BUILDING HEIGHT 45’
- MAX 3 STORIES
- CLOSED LAYOUT
- RESIDENTIAL OCCUPANCY R-2

*COST:

FLOOR CONSTRUCTION
11 7/8” DEEP TJI 360 @12” o.c. - \$3.35/sf
INSTALLATION AND MISC. - \$2.09/sf
ESTIMATED COST/SF TIMBER FLOOR - \$5.44/sf

WALL CONSTRUCTION
WOOD SIDING W/ 2x6 STUDS @16”o.c.
INSULATION AND 5/8” OSB PLYWOOD - \$4.43/sf
INSTALLATION AND MISC. - \$4.91/sf
ESTIMATED COST/SF TIMBER WALLS - \$9.34/sf

*CONSTRUCTABILITY:

- NO HEAVY MACHINERY NECESSARY FOR CONSTRUCTION.
- MODIFICATIONS TO MEMBERS ARE EASILY EXECUTED ON-SITE.
- MATERIALS ARE EASY TO TRANSPORT.
- ON-SITE MODIFICATIONS CREATES MATERIAL WASTE.

*SUSTAINABILITY:

- TIMBER WASTE IS RECYCLABLE.
- CONSUMES CO2 FROM ENVIRONMENT.
- INSULATION PROVIDED WITHIN EXTERIOR WALLS.
- GREEN ROOFS TO BE IMPLEMENTED.
- 50 YEAR EXPECTED LIFESPAN.
- SUBJECT TO MOLD, MILDEW, AND TERMITES.

*AESTHETICS:

- TIMBER FRAMING NOT EXPOSED.
- COMPATIBLE WITH DESIRED RAIN SCREEN

*FIRE RESISTANCE:

- TYPE V A CONSTRUCTION
- MINIMUM FIRE RESISTANCE RATING FOR:
 - PRIMARY STRUCTURAL FRAME - 1
 - INTERIOR AND EXTERIOR BEARING WALLS - 1
 - FLOOR CONSTRUCTION AND ROOF CONST. - 1
 - INTERIOR NONBEARING PARTITION WALLS - 0

CONCLUSION: TIMBER CONSTRUCTION CHOSEN DUE TO COST, BUILDING PROGRAM, AND CONSTRUCTABILITY.

UNDERGROUND PARKING

CONCRETE CONSTRUCTION

*BUILDING PROGRAM:

- MAX SPAN 40’.
- MAX HEIGHT 18’ WITH 1 INTERMEDIATE SLAB.
- OPEN LAYOUT.
- SORAGE GROUP OCCUPANCY S-2.
- EXPOSED TO EARTH AND SOIL.

*COST:

FLOOR CONSTRUCTION
24” COLUMN, 9” SLAB - \$10.35/sf
INSTALLATION AND MISC. - \$12.45/sf
ESTIMATED COST/SF CONC. FLOOR - \$24.80/sf

COST WILL INCREASE DUE TO PARTIALLY UNDER GROUND CONSTRUCTION

*CONSTRUCTABILITY:

- CONCRETE MATERIALS ARE HIGHLY AVAILABLE.
- FORMWORK CONSTRUCTION REQUIRED.
- ACCESS MUST BE PROVIDED FOR CONCRETE TRUCK.

*SUSTAINABILITY:

- 100 YEAR LIFESPAN.
- DURABLE MATERIAL.
- PRODUCE CO2 INTO THE ENVIRONMENT.
- CONCRETE IS DIFFICULT TO RECYCLE.

*AESTHETICS:

- CONCRETE PARTLY UNDERGROUND(HIDDEN FROM VIEW).
- MORE AESTHETICALLY PLEASING THAN CMU FOR THE CLIENT AND ARCHITECT.

*FIRE RESISTANCE:

- TYPE V A CONSTRUCTION
- MINIMUM FIRE RESISTANCE RATING FOR:
 - PRIMARY STRUCTURAL FRAME - 1
 - INTERIOR AND EXTERIOR BEARING WALLS - 1
 - FLOOR CONSTRUCTION AND ROOF CONST. - 1
 - INTERIOR NONBEARING PARTITION WALLS - 0

CONCLUSION: CONCRETE CONSTRUCTION CHOSEN DUE TO BUILDING PROGRAM, FIRE RESISTANCE, AND SUSTAINABILITY.

RET./OFFICE TIMBER CONSTRUCTION

*BUILDING PROGRAM:

- MAX SPAN 25’
- MAX BUILDING HEIGHT 30’
- MAX 2 STORIES
- OPEN LAYOUT
- OFFICE OCCUPANCY A-2 & RETAIL OCCUPANCY M

*COST:

FLOOR CONSTRUCTION
JOIST AND BEAM CONSTRUCTION - \$14.80/sf
INSTALLATION AND MISC. - \$4.39/sf
ESTIMATED COST/SF TIMBER FLOOR - \$19.19/sf

-REMAINING CRITERIA COINCIDE WITH RESIDENTIAL TIMBER CONSTRUCTION
CONCLUSION: TIMBER CONSTRUCTION CHOSEN DUE TO COST AND CONSTRUCTABILITY.

TABLE 508.4 REQUIRED SEPARATION OF OCCUPANCIES (HOURS)														
OCCUPANCY	A, E		I-1, I-3, I-4		I-2		R ^a		F-2, S-2 ^b , U		B, F-1, M, S-1		H-1	
	S	NS	S	NS	S	NS	S	NS	S	NS	S	NS	S	NS
A, E	N	N	1	2	2	NP	1	2	N	1	1	2	NP	NP
I-1, I-3, I-4	—	—	N	N	2	NP	1	NP	1	2	1	2	NP	NP
I-2	—	—	—	—	N	N	2	NP	2	NP	2	NP	NP	NP
R ^a	—	—	—	—	—	—	N	N	1 ^c	2 ^c	1	2	NP	NP
F-2, S-2 ^b , U	—	—	—	—	—	—	—	—	N	N	1	2	NP	NP
B, F-1, M, S-1	—	—	—	—	—	—	—	—	—	—	N	N	NP	NP
H-1	—	—	—	—	—	—	—	—	—	—	—	—	N	NP

N - NO SEPARATION REQUIREMENT
SPRINKLERS TO BE PROVIDED

OCCUPANCY CLASSIFICATION	TYPE OF CONSTRUCTION									
	SEE FOOTNOTES	TYPE I		TYPE II		TYPE III		TYPE IV	TYPE V	
		A	B	A	B	A	B	HT	A	B
R-2	NS ^{d, h}	UL	11	4	4	4	4	4	3	2
	S13R	4	4	4	4	4	4	4	4	3
	S	UL	12	5	5	5	5	5	4	3
S-2	NS	UL	11	5	3	4	3	4	4	2
	S	UL	12	6	4	5	4	5	5	3
M	NS	UL	11	4	2	4	2	4	3	1
	S	UL	12	5	3	5	3	5	4	2

IBC TABLE 504.4
ALLOWABLE NUMBER OF STORIES ABOVE GRADE

LATERAL SYSTEM SELECTION

RESIDENTIAL TIMBER CONSTRUCTION

- LIGHT-FRAME TIMBER SHEAR WALLS SHEATHED WITH WOOD STRUCTURAL PANELS RATED FOR SHEAR RESISTANCE SUPPORTING FLEXIBLE TIMBER DIAPHRAGM.
- *BUILDING PROGRAM:
 - CLOSED FLOOR LAYOUT
 - TIMBER SHEAR WALLS TAKE ADVANTAGE OF MULTIPLE INTERIOR WALLS.
 - RISK CATEGORY II
 - SHORT PERIOD RESPONSE ACCELERATION
- *SEISMIC PERFORMANCE:
 - MEETS SEISMIC REQUIREMENTS FOR SEISMIC DESIGN CATEGORY D - SEE TABLE BELOW.
- *COMPATIBILITY WITH GRAVITY SYSTEM:
 - GRAVITY SYSTEM: TIMBER FLOOR FRAMING WITH TIMBER LOAD BEARING WALLS.
 - INTERIOR LOAD BEARING WALLS CAN ALSO BE USED AS TIMBER SHEAR WALLS. TIMBER SHEAR WALLS ARE COMPATIBLE WITH TIMBER FLOOR FRAMING.
- *COST:
 - MATERIALS AND FASTENERS ARE READILY AVAILABLE.
 - MATERIAL AND INSTALLATION COST ARE LOW RELATIVE TO STEEL AND TIMBER.
 - WALLS CAN BE FABRICATED ON-SITE.

CONCLUSION: TIMBER CONSTRUCTION CHOSEN DUE TO COMPATIBILITY WITH GRAVITY SYSTEM, SEISMIC PERFORMANCE, AND COST.

CONCRETE PARKING CONSTRUCTION

- SPECIAL REINFORCED CONCRETE SHEAR WALLS WITH BOUNDARY ELEMENTS.
- SUPPORTS RIGID DIAPHRAGM CONCRETE SLAB.
- *BUILDING PROGRAM:
 - OPEN FLOOR LAYOUT
 - CONCRETE SHEAR WALLS ALSO ACT AS RETAINING WALLS.
 - RISK CATEGORY II
 - SHORT PERIOD RESPONSE ACCELERATION
- *SEISMIC PERFORMANCE:
 - MEETS SEISMIC REQUIREMENTS FOR SEISMIC DESIGN CATEGORY D - SEE TABLE BELOW.
- *COMPATIBILITY WITH GRAVITY SYSTEM:
 - GRAVITY SYSTEM: TIMBER FLOOR FRAMING ABOVE FIRST FLOOR WITH TIMBER LOAD BEARING WALLS.
 - NO INTERIOR WALLS TO USE AS SHEAR WALLS.
 - CONCRETE SHEAR WALLS COMPATIBLE WITH TIMBER SHEAR WALLS AND TIMBER FRAMING.

CONCLUSION: CONCRETE CONSTRUCTION CHOSEN DUE TO COMPATIBILITY WITH GRAVITY SYSTEM, SEISMIC PERFORMANCE, AND BUILDING PROGRAM.

RET./OFFICE TIMBER CONSTRUCTION

- LIGHT-FRAME TIMBER SHEAR WALLS SHEATHED WITH WOOD STRUCTURAL PANELS RATED FOR SHEAR RESISTANCE SUPPORTING FLEXIBLE TIMBER DIAPHRAGM.
- SPECIAL REINFORCED CONCRETE SHEAR WALLS PROVIDED ON STORE FRONT FACE.
- RISK CATEGORY II
- SHORT PERIOD RESPONSE ACCELERATION
- *BUILDING PROGRAM:
 - OPEN FLOOR LAYOUT
 - CONCRETE SHEAR WALL MINIMIZES AMOUNT OF WALL AREA AND MAXIMIZES POSSIBLE OPENINGS FOR RETAIL STORE FRONT.
- *SEISMIC PERFORMANCE:
 - MEETS SEISMIC REQUIREMENTS FOR SEISMIC DESIGN CATEGORY D - SEE TABLE BELOW.
- *COMPATIBILITY WITH GRAVITY SYSTEM:
 - GRAVITY SYSTEM: TIMBER FLOOR FRAMING WITH TIMBER BEAMS BETWEEN COLUMNS AND EXTERIOR WALLS
 - MINIMAL INTERIOR WALLS TO USE FOR SHEAR WALL LOCATIONS.

-REMAINING CRITERIA COINCIDE WITH TIMBER AND CONCRETE CONSTRUCTION CRITERIA.

CONCLUSION: TIMBER CONSTRUCTION CHOSEN DUE TO COMPATIBILITY WITH GRAVITY SYSTEM, SEISMIC PERFORMANCE, AND COST.

TABLE 12.2-1 DESIGN COEFFICIENTS AND FACTORS FOR SEISMIC FORCE-RESISTING SYSTEMS									
Seismic Force-Resisting System	ASCE 7 Section where Detailing Requirements are Specified	Response Modification Coefficient, R^a	System Overstrength Factor, Ω_0^g	Deflection Amplification Factor, C_d^b	Structural System Limitations and Building Height (ft) Limit ^c				
					Seismic Design Category				
					B	C	D ^d	E ^d	F ^e
B. BUILDING FRAME SYSTEMS									
5. Special reinforced concrete shear walls	14.2 and 14.2.3.6	6	2½	5	NL	NL	160	160	100
23. Light-framed walls sheathed with wood structural panels rated for shear resistance or steel sheets	14.1, 14.1.4.2, and 14.5	7	2½	4½	NL	NL	65	65	65

FOUNDATION SYSTEM SELECTION

MAT SLAB FOUNDATION

- PRIMARILY CLAY SOIL PROVIDES 1,500 PSF VERTICAL FOUNDATION PRESSURE.
- CLAY IS AN EXPANSIVE SOIL.
- POTENTIAL WATER TABLE BELOW GRADE.
- TOP FACE OF CONCRETE FOUNDATION MUST BE LEVEL.
- BOTTOM FACE IS PERMITTED TO SLOPE 10% MAXIMUM AT ANY GIVEN POINT.
- IF THE SOIL IS TO CONTRACT OR EXPAND, THE BUILDING WILL SINK OR RISE AS AN ENTIRE UNIT ABOVE THE MAT FOUNDATION.
- MAT FOUNDATION DOES NOT REQUIRE DRILLING OR HEAVY MACHINERY THAT CAUSE NOISE AND VIBRATIONS THAT COULD DISTURB THE SURROUNDING NEIGHBORHOOD.
- SHORED EXCAVATION ALLOWS EDGE OF MAT FOUNDATION BUTT UP AGAINST PROPERTY LINE.
- STEEL PILES AND TIMBER LAGGING IS TO BE ERECTED BEFORE FOUNDATION POUR.

CONCLUSION: DUE TO POOR SOIL QUALITY, MAT FOUNDATIONS OR DEEP FOUNDATIONS ARE BEST OPTIONS. DUE TO SURROUNDING RESIDENTIAL, MAT FOUNDATION CONSTRUCTION IS LESS INTRUSIVE IN RELATION TO NOISE AND VIBRATIONS.

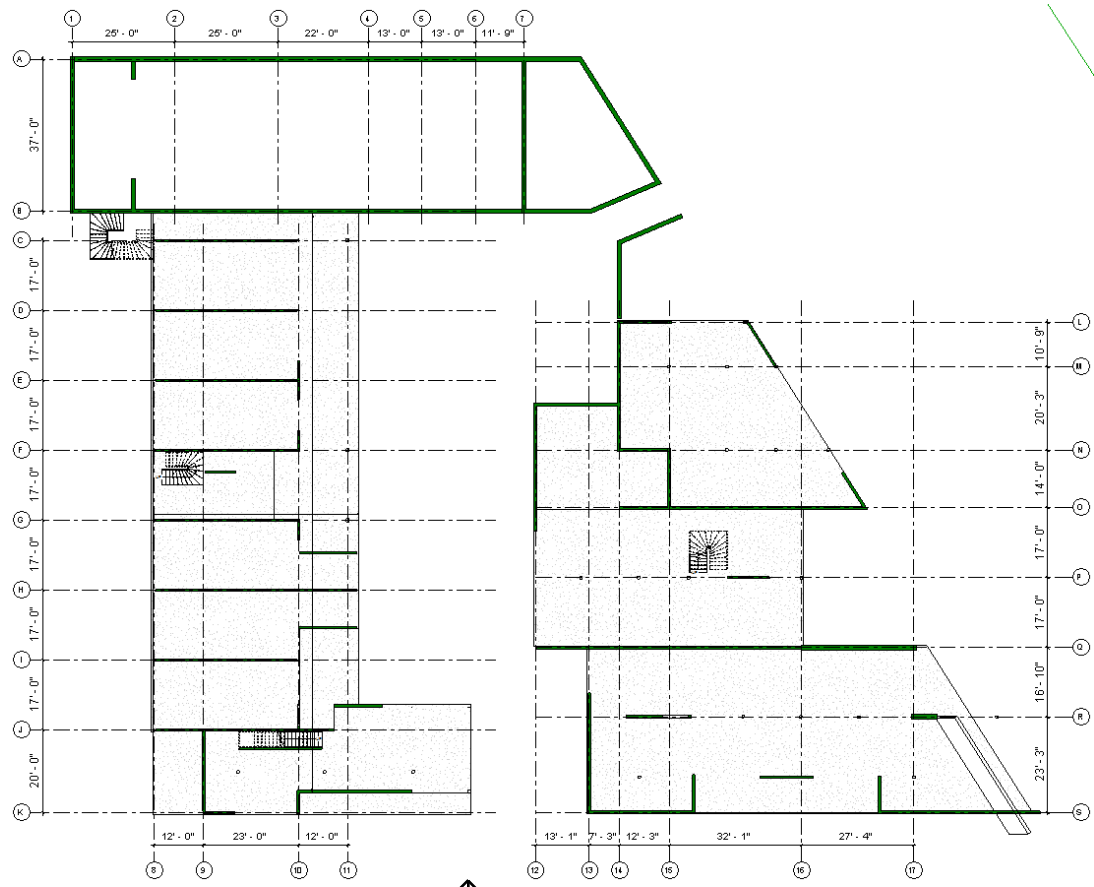
RETAINING WALL FOUNDATION

- FREE STANDING RETAINING WALLS ARE NOT COMBINED IN MAT FOUNDATION.
- KEY ALLOWS FOUNDATION TO BUTT UP AGAINST PROPERTY LINE.
- RETAINING AND BEARING WALLS ARE COMBINED IN MAT FOUNDATION.
- PRIMARILY CLAY SOIL PROVIDES 100PSF LATERAL BEARING PRESSURE (POOR QUALITY).
- MAX HEIGHT OF RETAINING AND LOAD BEARING WALL 18’ (SIMPLY SUPPORTED)
- POTENTIAL WATER TABLE BELOW GRADE.
- SHALLOW WALL FOOTING AVOIDS THE USE OF VIBRATIONS AND SOUND.

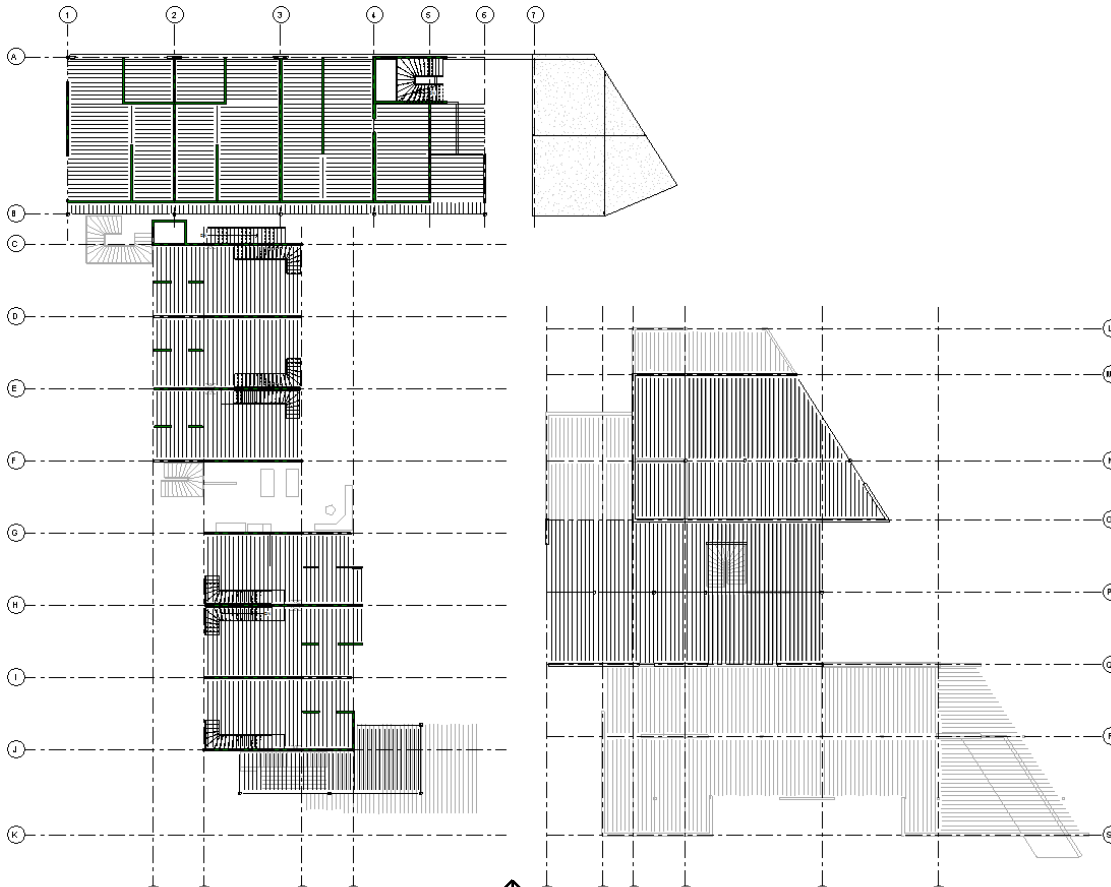
FOUNDATION ELEMENT OR CONDITION	SPECIFIED COMPRESSIVE STRENGTH, f'_c
1. Foundations for structures assigned to Seismic Design Category A, B or C	2,500 psi
2a. Foundations for Group R or U occupancies of light-frame construction, two stories or less in height, assigned to Seismic Design Category D, E or F	2,500 psi
2b. Foundations for other structures assigned to Seismic Design Category D, E or F	3,000 psi

IBC TABLE 1808.8.1 - SOIL REQUIREMENTS

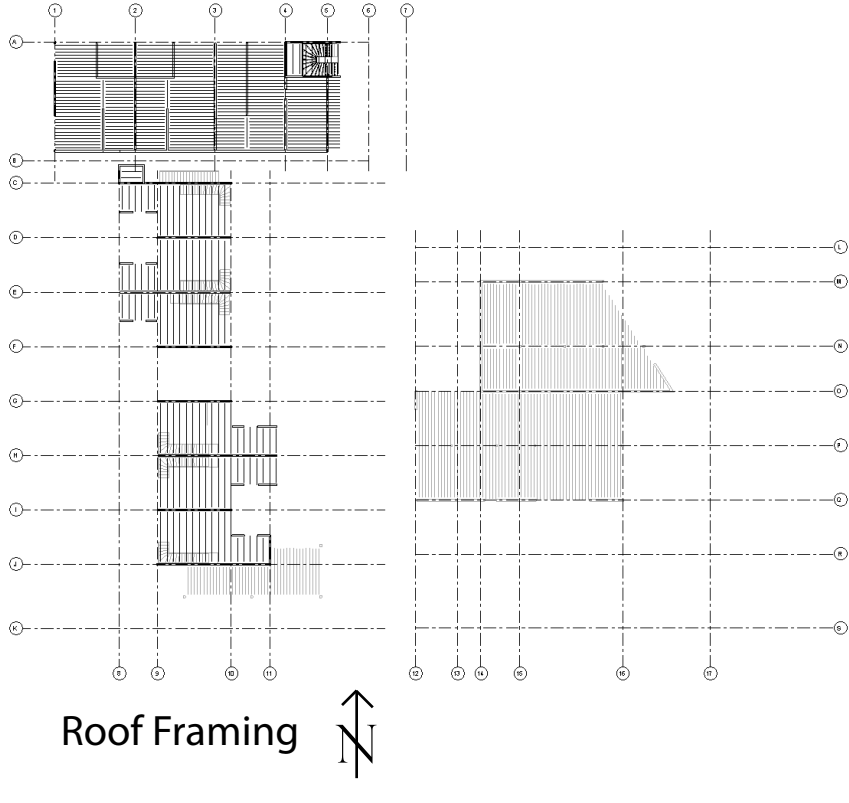
GRAVITY SYSTEM CONFIGURATION



First Floor Bearing Walls



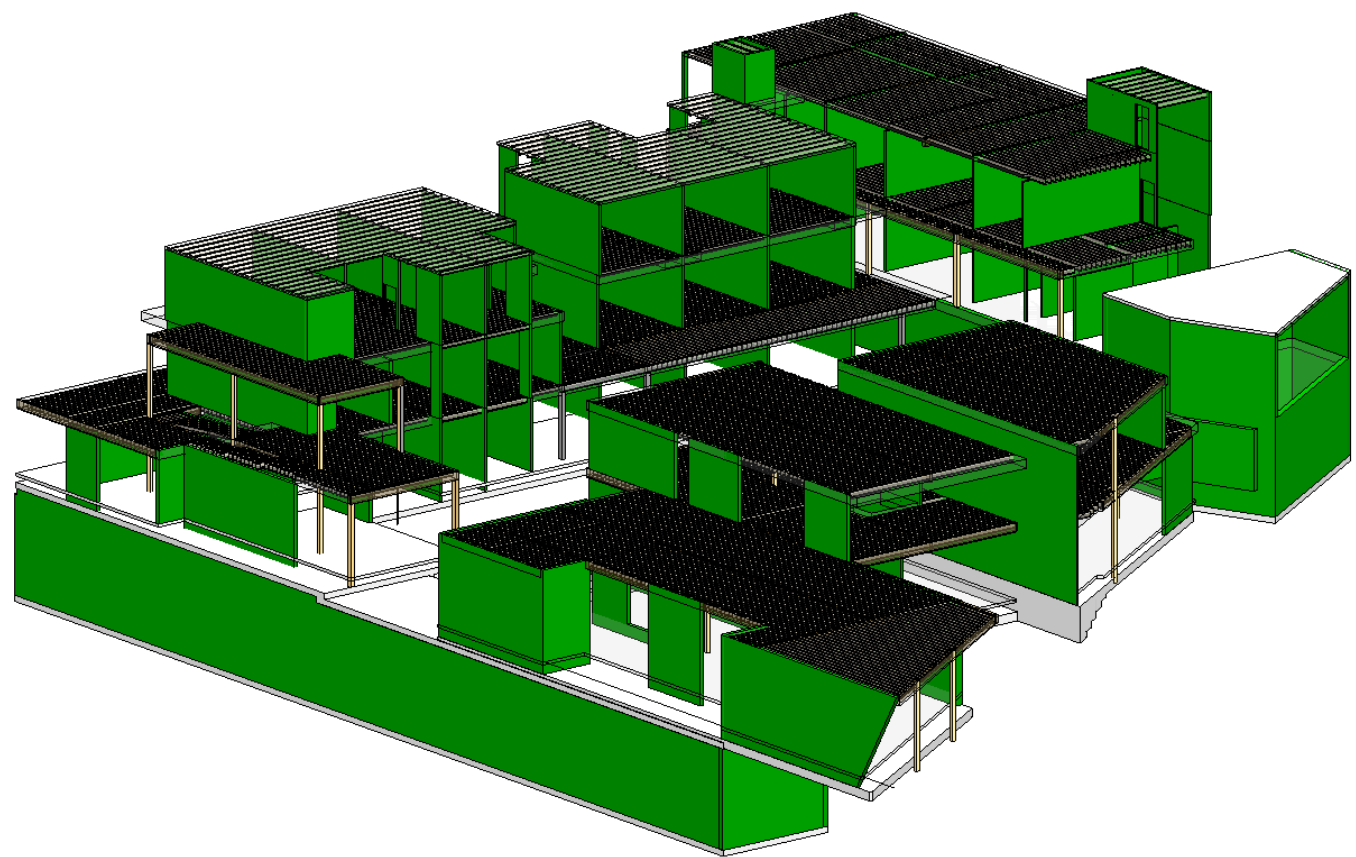
Third Floor Bearing Walls



Roof Framing



Second Floor Bearing Walls



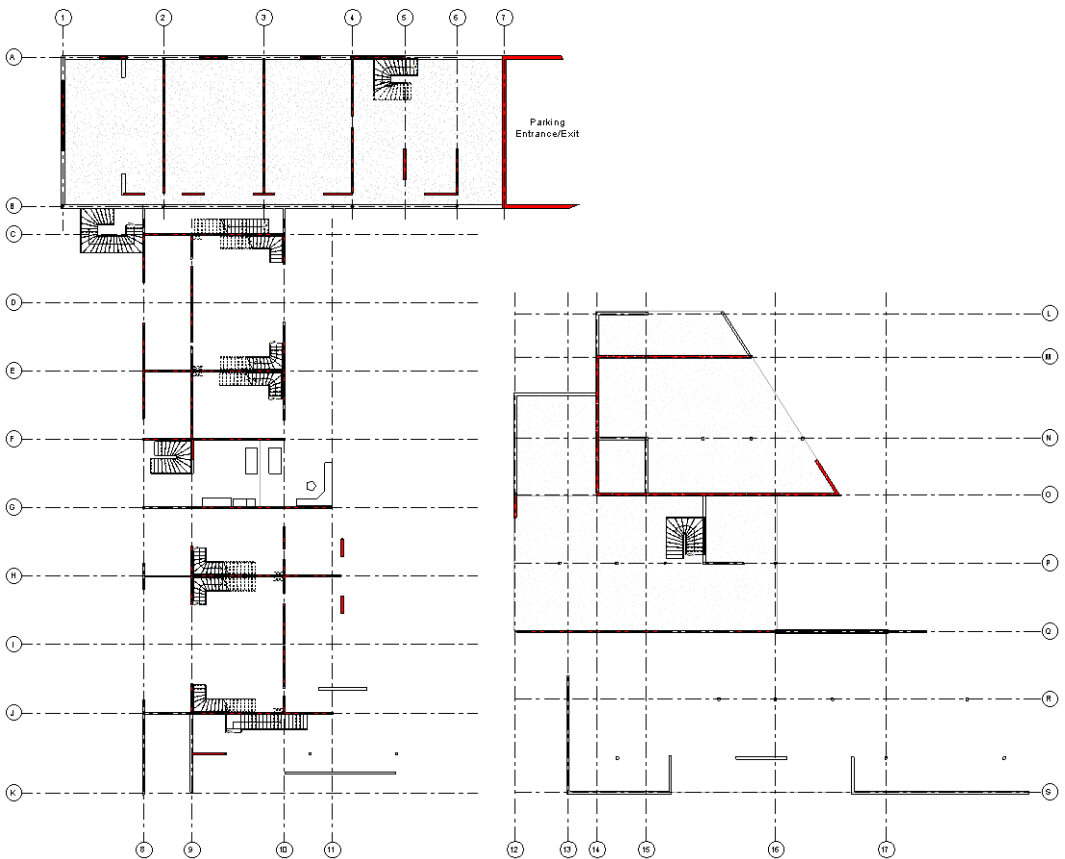
LATERAL SYSTEM CONFIGURATION



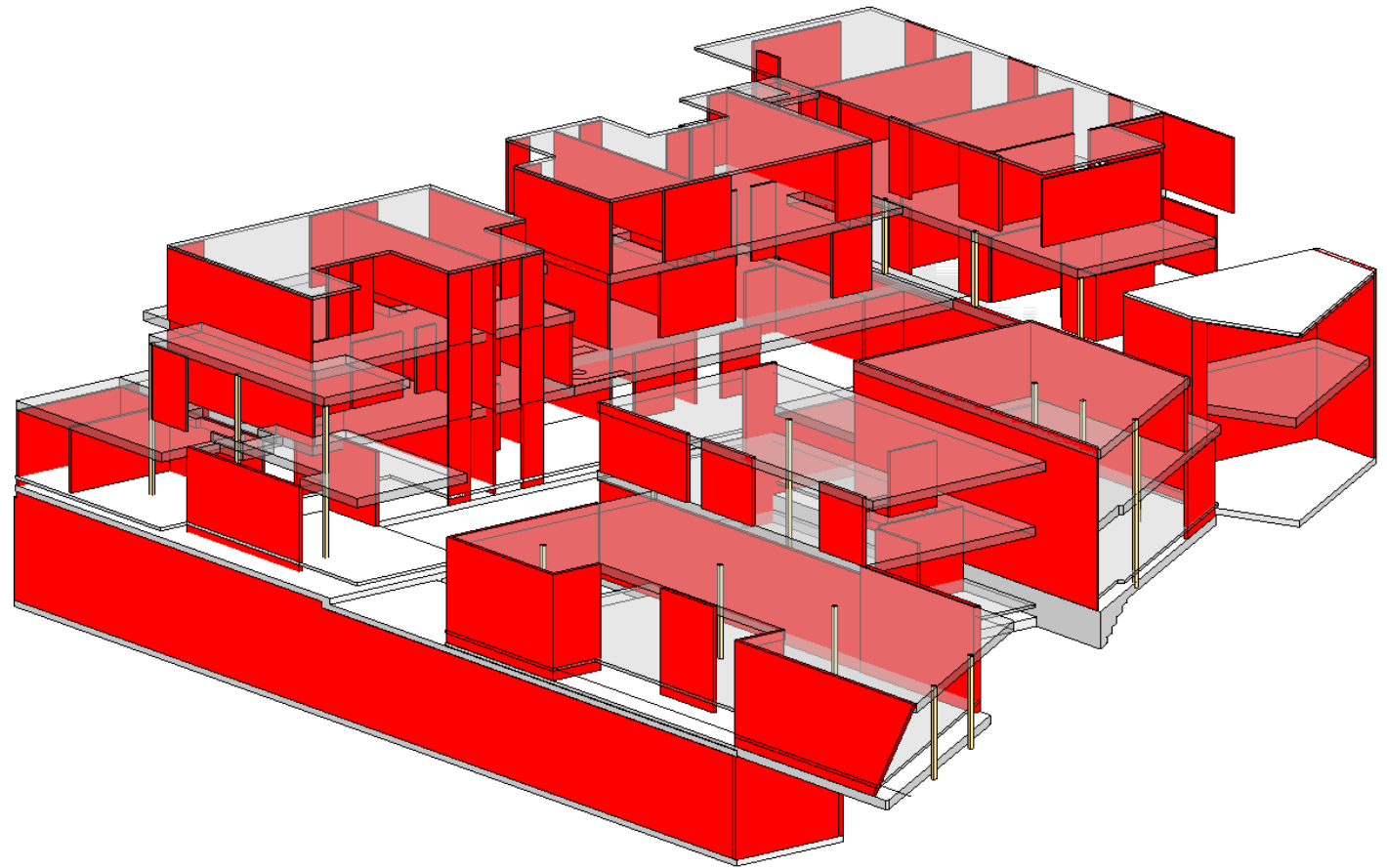
First Floor Shear Walls



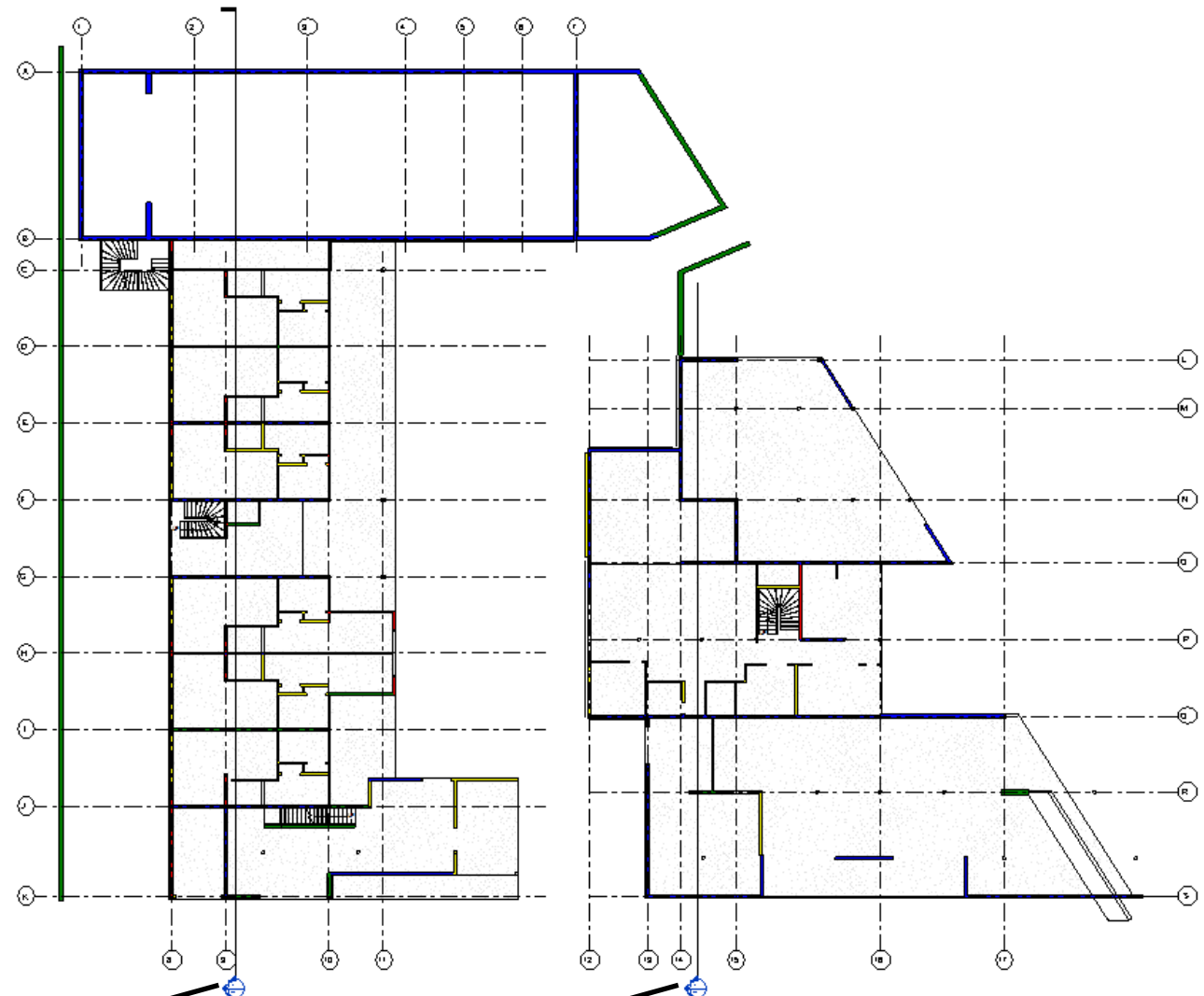
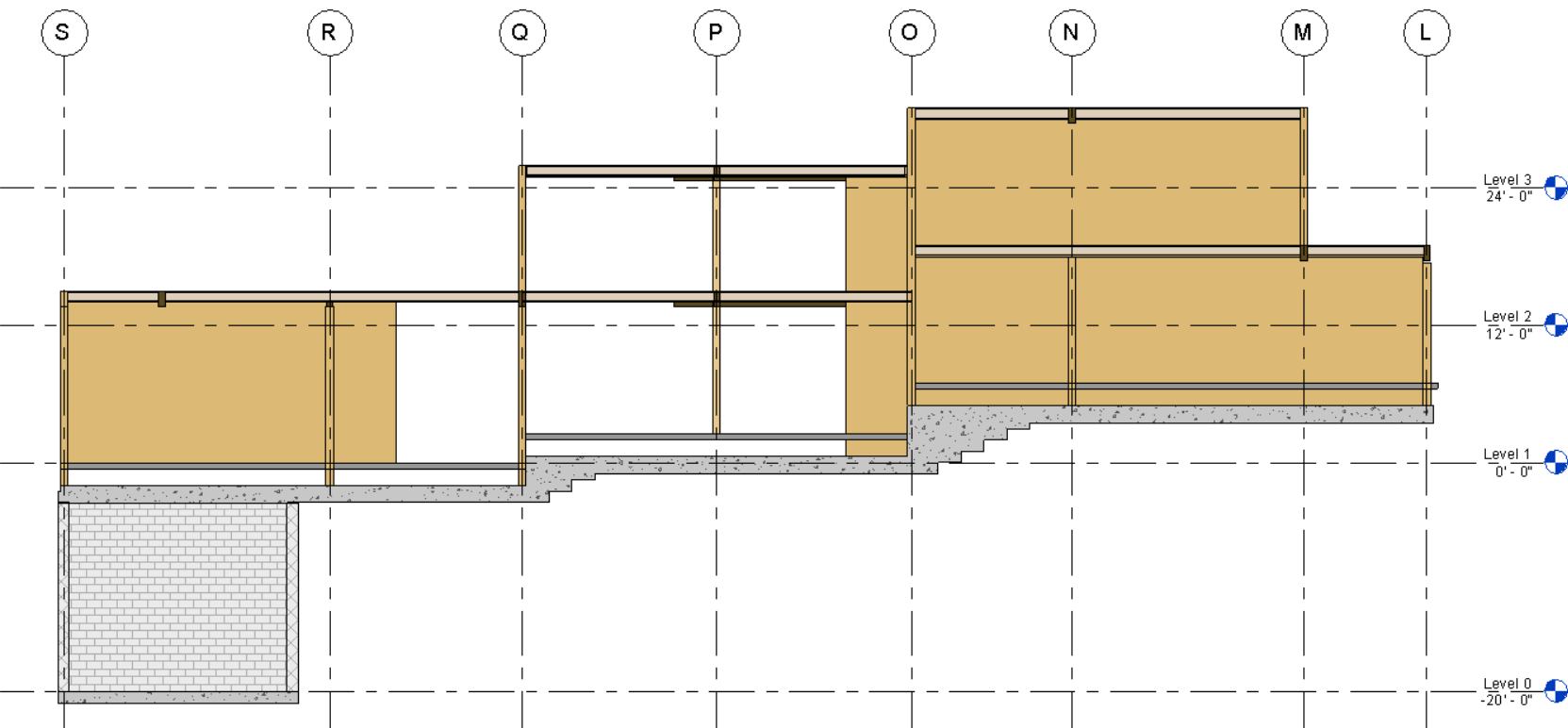
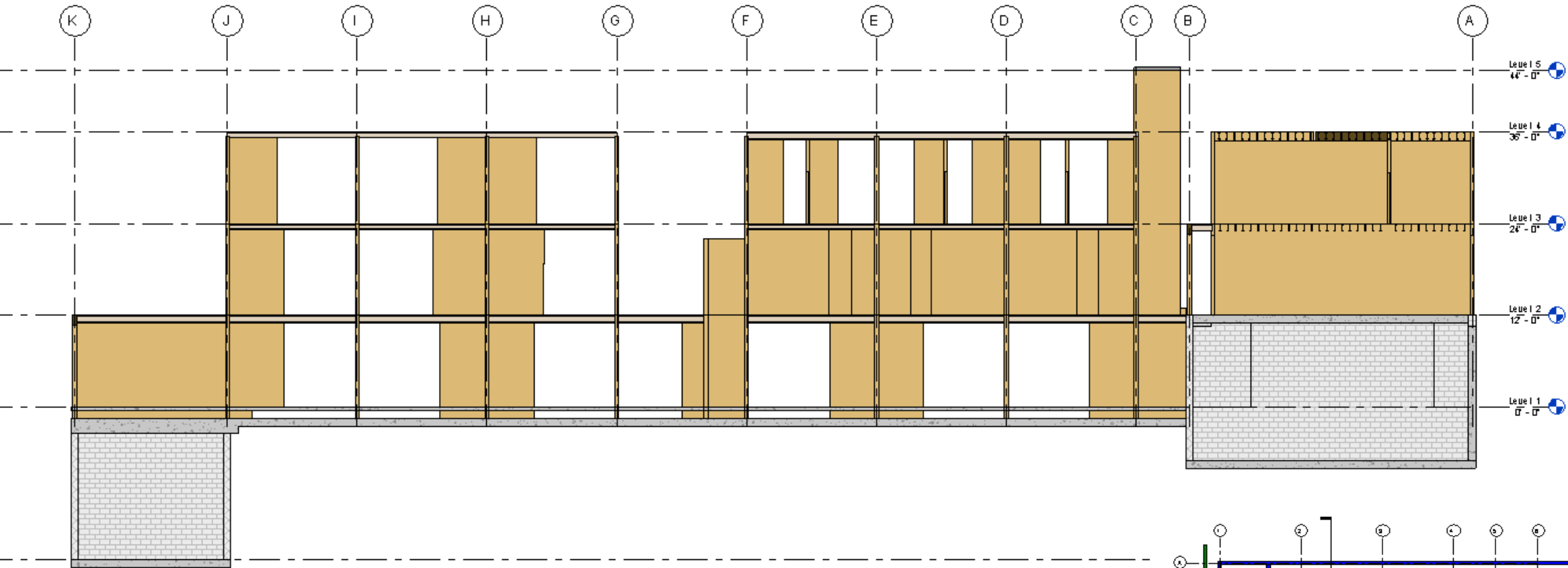
Third Floor Shear Walls



Second Floor Shear Walls



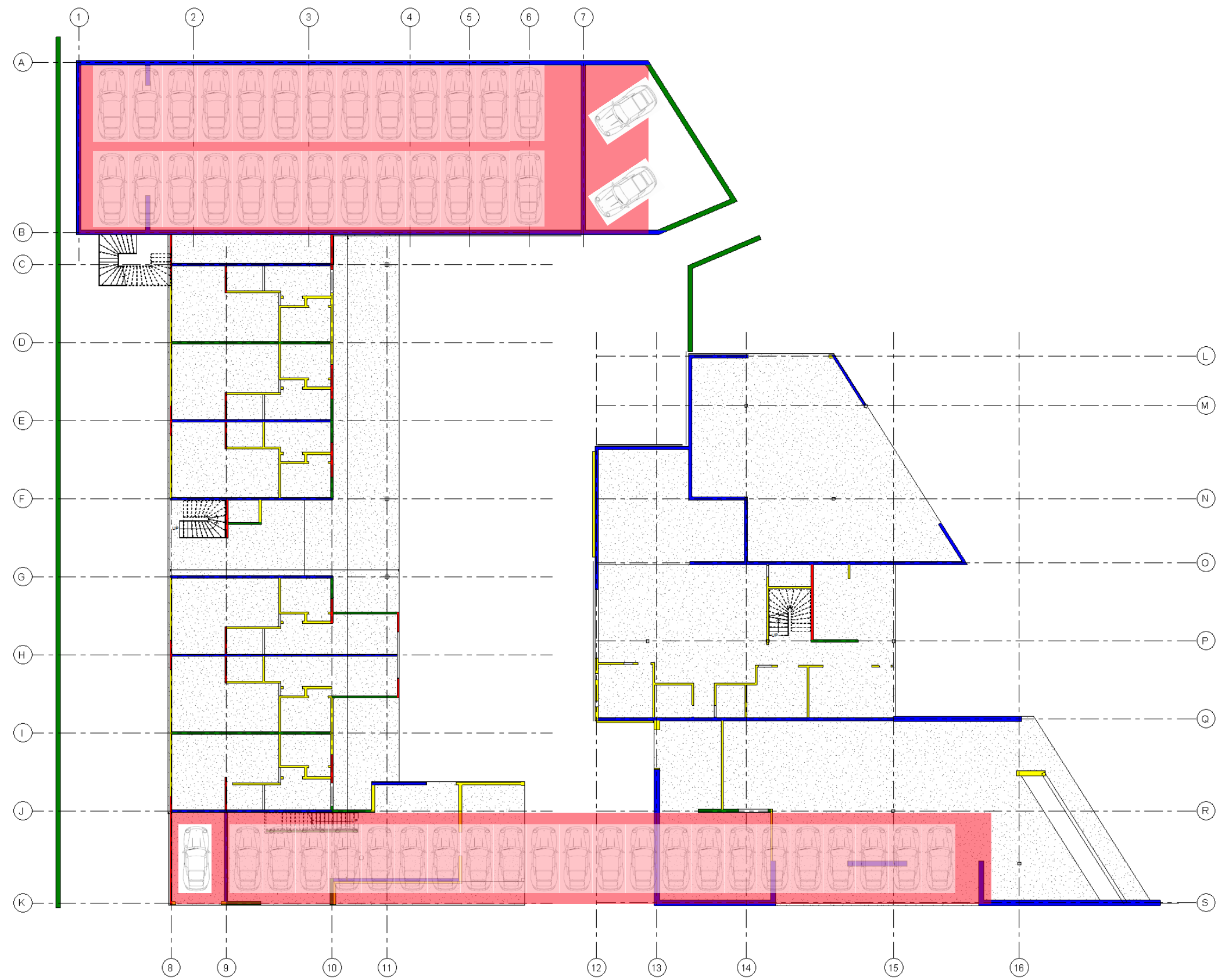
FOUNDATION SYSTEM CONFIGURATION



Section 1

Section 2

PARKING SYSTEM CONFIGURATION



PARKING NORTH

-120FT X 40FT X 18FT = 86,400 CUBIC FT.

-PROVIDES ENOUGH SPACE FOR 46 PARKING SPOTS.

-CAR ROTATION PLATFORM NECESSARY

-PARKING FOR RESTAURANT AND RETAIL.

PARKING SOUTH

-140FT X 25FT X 18FT = 63,000 CUBIC FT.

-PROVIDES ENOUGH SPACE FOR 30 PARKING SPOTS.

-PARKING FOR RESIDENTIAL TENANTS ONLY.

-76 TOTAL PARKING SPOTS PROVIDED.

GRAVITY SYSTEM SIZING

ROOF DEAD LOAD TAKEOFF

INSULATION	3 psf
M.E.P.	2 psf
CEILING	1 psf
4" LOOSE SOIL (75pcf)(1/8')	25 psf
MEMBER SELF WEIGHT	10 psf
MISC.	4 psf
TOTAL ROOF DEAD LOAD	45 psf

FLOOR DEAD LOAD TAKEOFF

M.E.P.	2 psf
CEILING	1 psf
2" L.W.C. TOP (100pcf)(3/12')	16.7 psf
MEMBER SELF WEIGHT	10 psf
WALL WEIGHT	8 psf
MISC.	7.3 psf (CONVENIENCE PURPOSES TO MATCH ROOF)
TOTAL FLOOR DEAD LOAD	45 psf

ROOF LIVE LOADS

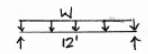
OCCUPIABLE ROOF GARDENS: 100 psf
NON-OCCUPIABLE ROOF GARDENS: 20 psf

FLOOR LIVE LOADS

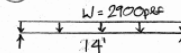
CORRIDOR LOADING = 65 psf + 15 psf PARTITIONS

* FOR CONVENIENCE + CONSERVATIVE USE L.L. = 100 psf

TYPICAL ROOF BEAMS

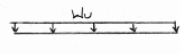
RB ①

 $A_t = (12')(12') = 144 \text{ sf}$
 TRIB WIDTH = 12'
 $W_D = 45 \text{ psf}$
 $W_L = 100 \text{ psf}$
 $W = (45 \text{ psf})(12 \text{ ft})$
 $W = 1740 \text{ plf}$
 TRY PSL 7" x 11 7/8"
 $W_{all} = 21875 \text{ plf} > 1740 \text{ plf} \checkmark$

USE PSL 7" x 11 7/8" FOR ROOF BEAMS RB ①

RB ②

 $A_t = (14')(20') = 280 \text{ sf}$
 TRIB WIDTH = 20'
 $W_D = 45 \text{ psf}$
 $W_L = 100 \text{ psf}$
 $W = (145 \text{ psf})(20 \text{ ft})$
 $W = 2900 \text{ plf}$
 TRY PSL 7" x 18"
 $W_{all} = 3,320 \text{ plf} > 2900 \text{ plf} \checkmark$

USE PSL 7" x 18" FOR ROOF BEAMS RB ②

STEEL BEAM

FB ③ MAX LENGTH = 50' BETWEEN STEEL COLUMNS

 $W_L = 100 \text{ psf}$
 $W_D = 45 \text{ psf}$
 $W_U = 1.2 W_D + 1.6 W_L$
 $W_U = 1.2(45 \text{ psf})(6') + 1.6(100 \text{ psf})(6')$
 $W_U = 1284 \text{ plf}$
 $M_3 = \frac{W_U L^2}{8} = \frac{(1284)(50^2)}{8} = 401,250 \text{ ft-lb}$
 $M_U = 401,250 \text{ ft-lb}$
 $\Delta_{max} = \frac{5 W_U L^4}{384 EI} = \frac{5(1284)(50^4)(12)}{384(29,000)(I)}$
 $\Delta_{max} = \frac{6626.3}{I}$
 IBC $\Delta_{DL} = \frac{8}{240} = 2.5" = \Delta_U$
 AISC $\frac{6626.3}{I} = \Delta_{max} \geq \Delta_U = 2.5$
 $I \geq 2650 \text{ in}^4$
 TRY W27 x 84, $F_y = 50 \text{ ksi}$
 $I = 2850 \text{ in}^4 > 2650 \text{ in}^4 \checkmark$ SAFE IN DEF.
 $\phi M_U = 915 \text{ k-ft} > 401 \text{ k-ft} = M_U \checkmark$ SAFE IN BENDING

USE W27 x 84 STEEL BEAM, $F_y = 50 \text{ ksi}$ FOR FB ③

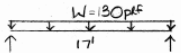
BEARING WALL CALCULATION

* BY OBSERVATION, CRUSHING OF THE SILL VIA COMPRESSION PERPENDICULAR TO GRAIN WILL GOVERN
 TRY 3x4 INTERIOR STUDS.
 WORST CASE BEARING WALL TRIB WIDTH = 17'
 $W = (17')(45 \text{ psf}) = 2463 \text{ plf OF WALL}$
 $F_{cF}(2463 \text{ plf})(\frac{16'}{12}) = 3284 \text{# PER STUD @ 16" C.C.}$
 $F_{cL} = (625 \text{ psi})(6 \text{ in})(\frac{16'}{12})(1.0)$
 $F_{cL} = (625 \text{ psi})(2.5' \times 3.5') = 5468.75 \text{# PER STUD}$
 $F_{cL} = 5468 \text{# PER STUD} > 2463 \text{ plf} = F_{cL} \checkmark$

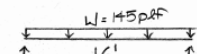
USE 3x4 INTERIOR STUDS @ 16" C.C. FIRST FLR
 USE 3x6 EXTERIOR STUDS @ 16" C.C. FIRST FLR

BY OBSERVATION, 2x4 STUDS @ 16" C.C. FLS ABOVE INTERIOR
 2x6 STUDS @ 16" C.C. FLS ABOVE EXTERIOR

TYPICAL ROOF JOISTS

RJ ①

 $A_t = 34 \text{ sf} < 200 \text{ sf}$ NO L.L. REDUCE
 TRIB WIDTH = 2'
 $W_D = 45 \text{ psf}$
 $W_L = 20 \text{ psf}$
 $W = (45 \text{ psf} + 20 \text{ psf})(2')$
 $W = 130 \text{ plf}$
 TRY TJI 560 11 7/8"
 $W_c = 132 \text{ plf} > 130 \text{ plf} = W \checkmark$

USE TJI 560 11 7/8" @ 2' C.C. FOR 17' ROOF JOIST RJ ①

RJ ②

 * OCCUPIABLE ROOF GARDEN + $W_L = 100 \text{ psf}$
 TRIB WIDTH = 1'
 $W_D = 45 \text{ psf}$
 $W_L = 100 \text{ psf}$
 $W = (145 \text{ psf})(1')$
 $W = 145 \text{ plf}$
 TRY TJI 560 11 7/8"
 $W_c = 148 \text{ plf} > 145 \text{ plf} \checkmark$

USE TJI 560 11 7/8" @ 1' C.C. FOR 16' ROOF JOIST RJ ②

TYPICAL FLOOR JOISTS

$(W_L)_{OCCUPIABLE} \approx (W_L)_{FLOOR} \approx 100 \text{ psf}$
 $(W_D)_{OCCUPIABLE} \approx (W_D)_{FLOOR} \approx 45 \text{ psf}$
 16' MAX LENGTH
 °° USE RJ ② AT FLOOR JOISTS. SEE RJ.
 TJI 560 11 7/8" @ 1' C.C. SPACING

TYPICAL FLOOR BEAMS

FOR SAME REASONING, USE RB ① AT FLOOR BM ①
 PSL 7" x 11 7/8" FB ①
 USE RB ② AT FLOOR BEAM ②
 PSL 7" x 18" FB ②

TIMBER COLUMNS

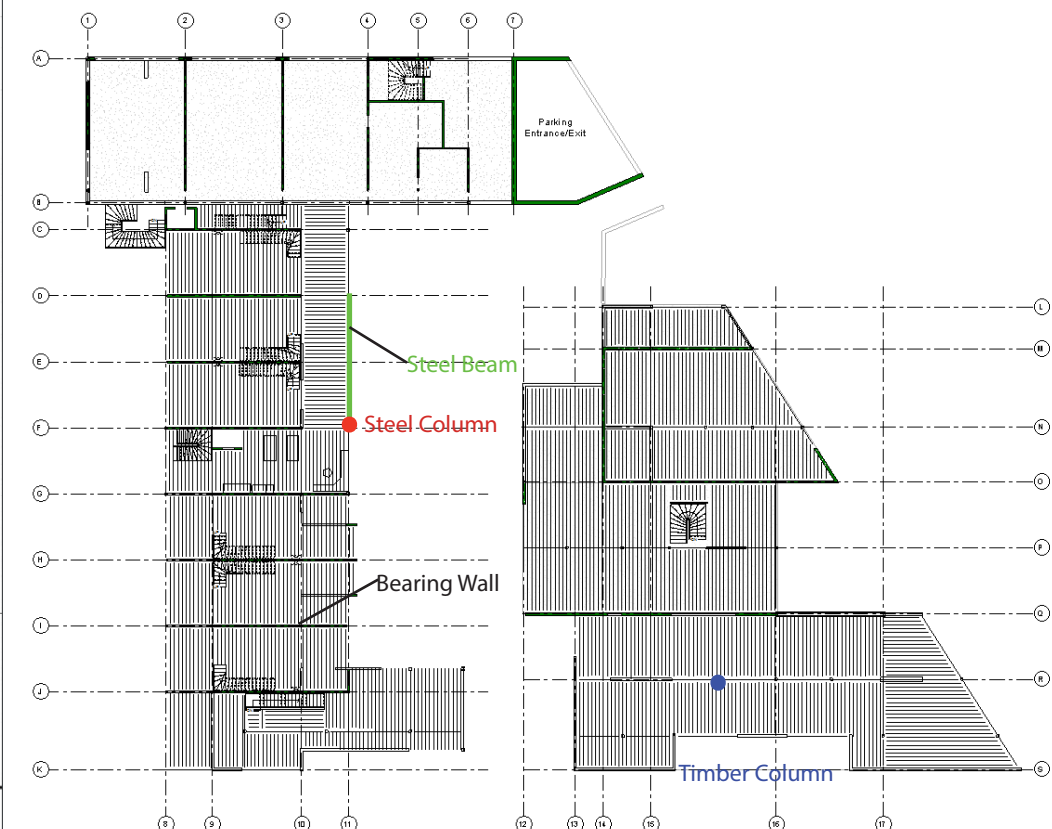
C ①
 MAX TRIB AREA = 14' x 20' = 280 sf
 $F_c = \frac{P}{A} = \frac{(145 \text{ psf})(2 \text{ STORIES})(280 \text{ sf})}{A} = \frac{81200 \text{#}}{A}$
 $F_c = 1,150 \text{ psi}$ SELECT STRUCTURAL
 $F_c = 1,150 \text{ psi}$
 ASSUME $C_p = 1.0 \Rightarrow F'_c = 1,150 \text{ psi}$
 TRY 10x10 SELECT STRUCTURAL TIMBER COLUMN
 $F_c = \frac{81200 \text{#}}{100 \text{ in}^2} = 812 \text{ psi} < F'_c = 1,150 \text{ psi} \checkmark$

USE 10x10 SELECT STRUCTURAL FOR 1ST FLR COLUMN

C ② COLUMNS ABOVE
 $F_c = \frac{P}{A} = \frac{(145 \text{ psf})(1 \text{ STORY})(280 \text{ sf})}{A} = \frac{40600 \text{#}}{A}$
 $F_c = 1,150 \text{ psi}$
 TRY 6x6 SELECT STRUCTURAL
 $F_c = \frac{40600 \text{#}}{36 \text{ in}^2} = 1127.78 \text{ psi} < F'_c = 1,150 \text{ psi} \checkmark$

USE 6x6 SELECT STRUCTURAL FOR COLUMNS ABOVE


C ③ STEEL COLUMNS *LRFD
 TRIB AREA = (34')(6') = 204 ft²
 $W_L = 100 \text{ psf}$
 $W_D = 45 \text{ psf}$
 $W_U = 1.2 W_D + 1.6 W_L = 214 \text{ psf} = W_U$
 $P_U = (204 \text{ ft}^2)(214 \text{ psf}) = 43,656 \text{#} = 44 \text{ k}$
 $W_{12} \times 40: \phi P_n = 318 \text{ k} > 44 \text{ k} = P_U \checkmark$
 USE W12x40, $F_y = 50 \text{ ksi}$ FOR STEEL COLUMNS



LATERAL SYSTEM SIZING

6/1/2016

Design Maps Summary Report

 **USGS Design Maps Summary Report**

User-Specified Input

Building Code Reference Document

ASCE 7-10 Standard

(which utilizes USGS hazard data available in 2008)

Site Coordinates

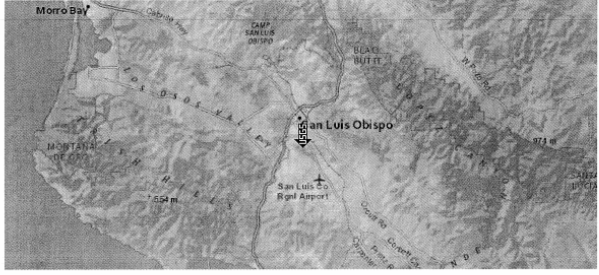
35.27068°N, 120.65736°W

Site Soil Classification

Site Class D - "Stiff Soil"

Risk Category

I/II/III



USGS-Provided Output

$S_s = 1.168\text{ g}$

$S_1 = 0.445\text{ g}$

$S_{M5} = 1.206\text{ g}$

$S_{M1} = 0.692\text{ g}$

$S_{OS} = 0.804\text{ g}$

$S_{O1} = 0.461\text{ g}$

For information on how the S_s and S_1 values above have been calculated from probabilistic (risk-targeted) and deterministic ground motions in the direction of maximum horizontal response, please return to the application and select the "2009 NEHRP" building code reference document.

MCE_R Response Spectrum

Design Response Spectrum

For PGA_w , T_u , C_{vs} , and C_{d1} values, please view the detailed report.

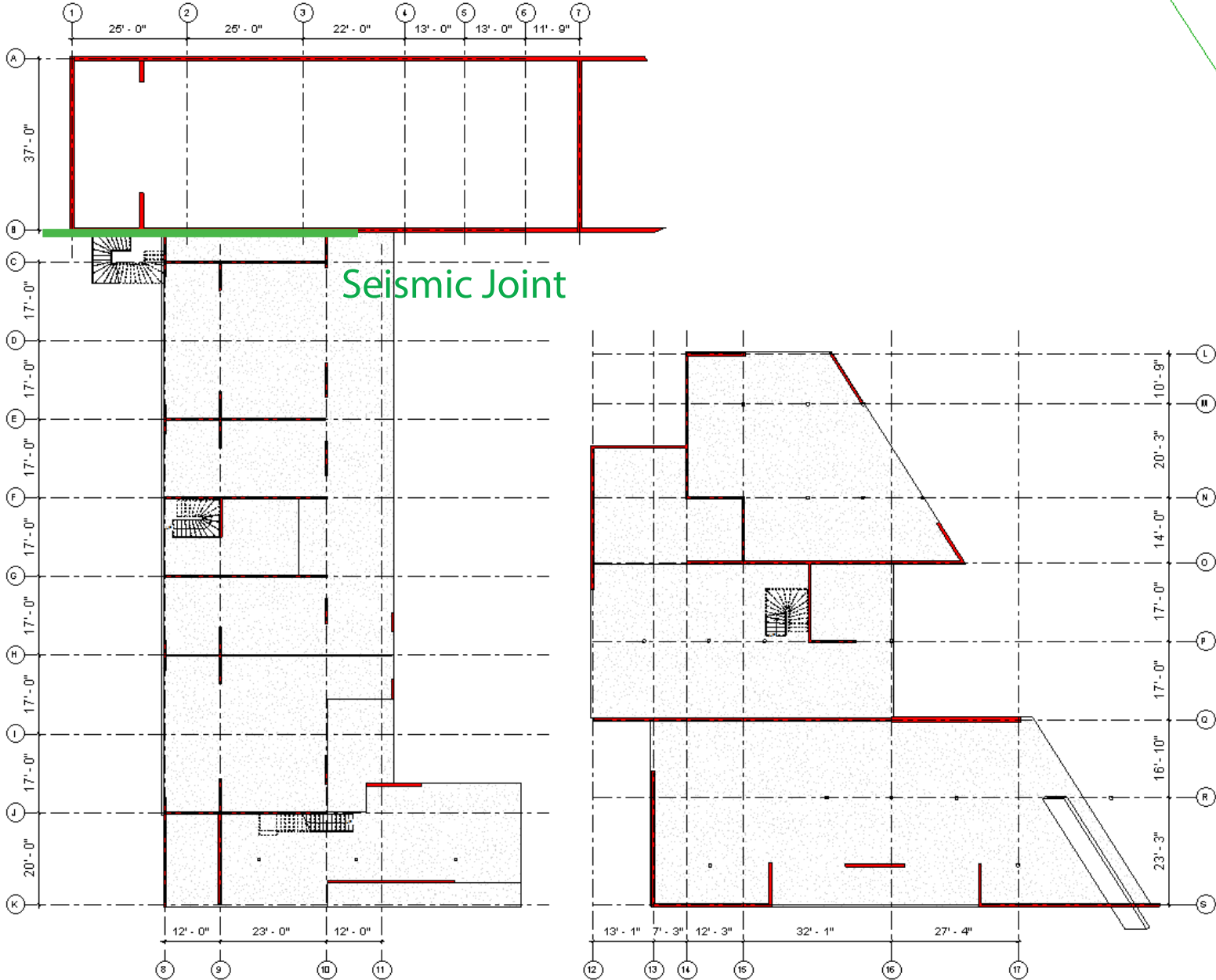
Although this information is a product of the U.S. Geological Survey, we provide no warranty, expressed or implied, as to the accuracy of the data contained therein. This tool is not a substitute for technical subject-matter knowledge.

<http://ehp2-earthquake.wr.usgs.gov/designmaps/us/summary.php?template=minimal&latitude=35.27068154679306&longitude=-120.6573639795596&siteclass=...> 1/1

LATERAL SYSTEM CALCULATIONS

$V = C_s W$
 $C_s = \frac{S_{OS}}{R/I_e}$
RISK CATEGORY II $\Rightarrow I_e = 1.0$
TIMBER SHEAR WALLS $\Rightarrow R = 7, \gamma = 2.5$
 $C_s = \frac{0.804}{7/1} = 0.1149 = C_s \quad (C_s)_{min} < C_s < (C_s)_{max} \checkmark$
 $W = (7,000)(45\text{psf}) + (6,000)(45\text{psf}) + (4,500)(45\text{psf})$
 $W = 787.5\text{ k} \quad \text{*Worst Case*}$
 $V = (0.1149)(787.5\text{ k}) = 90.5\text{ k}$
 $V = 90.5\text{ k}$
SHEAR WALL CAPACITIES FROM SHEATHING TABLES
TRY STRUCTURAL 1 OSB W/ 8d NAILS
① 4" CONT. PANEL EDGES PARALLEL TO LOAD
② 6" ALL OTHER EDGES
 $V_u = 720\text{ plf} \Rightarrow \text{CONVERT TO ASD}$
 $V_n = \frac{V_u}{2} = \frac{720}{2} = 360\text{ plf} = V_n$
 $V_n = 360\text{ plf}; \gamma = 2.5$
 $\frac{V_n}{\gamma} \geq V \Rightarrow \frac{V}{\gamma} = \text{LENGTH OF WALL}$
 $\frac{90,500}{360} = 251\text{ FT OF WALL}$
N-S 250'± OF WALL ON 1ST FLOOR IS PROVIDED ✓
E-W 150'± OF WALL ON 1ST FLOOR IS PROVIDED ✓

- LENGTH OF SHEAR WALL
CHECKED FOR WORST CASE
ONLY:
RESIDENTIAL BUILDING
GRIDLINES C-K AND 8-11



FOUNDATION SYSTEM SIZING

ACI
TBL 22.6.5.2

MAT FOUNDATION

*BY OBSERVATION, 2-WAY PUNCHING SHEAR WILL GOVERN.

$V_u = 44^k$ SEE STEEL COLUMN

$\phi V_c = 4 \lambda \sqrt{F'_c} b_o d$

$b_o = 4 d_{col} + 4 d$

$b_o = 4(27') + 4 d$

$b_o = 108 + 4 d$

$\phi V_c = 4(1.0)(\sqrt{3000})(108 + 4 d) d$

$\phi V_c = 23661.6 d + 876.4 d^2 \geq 44,000^*$

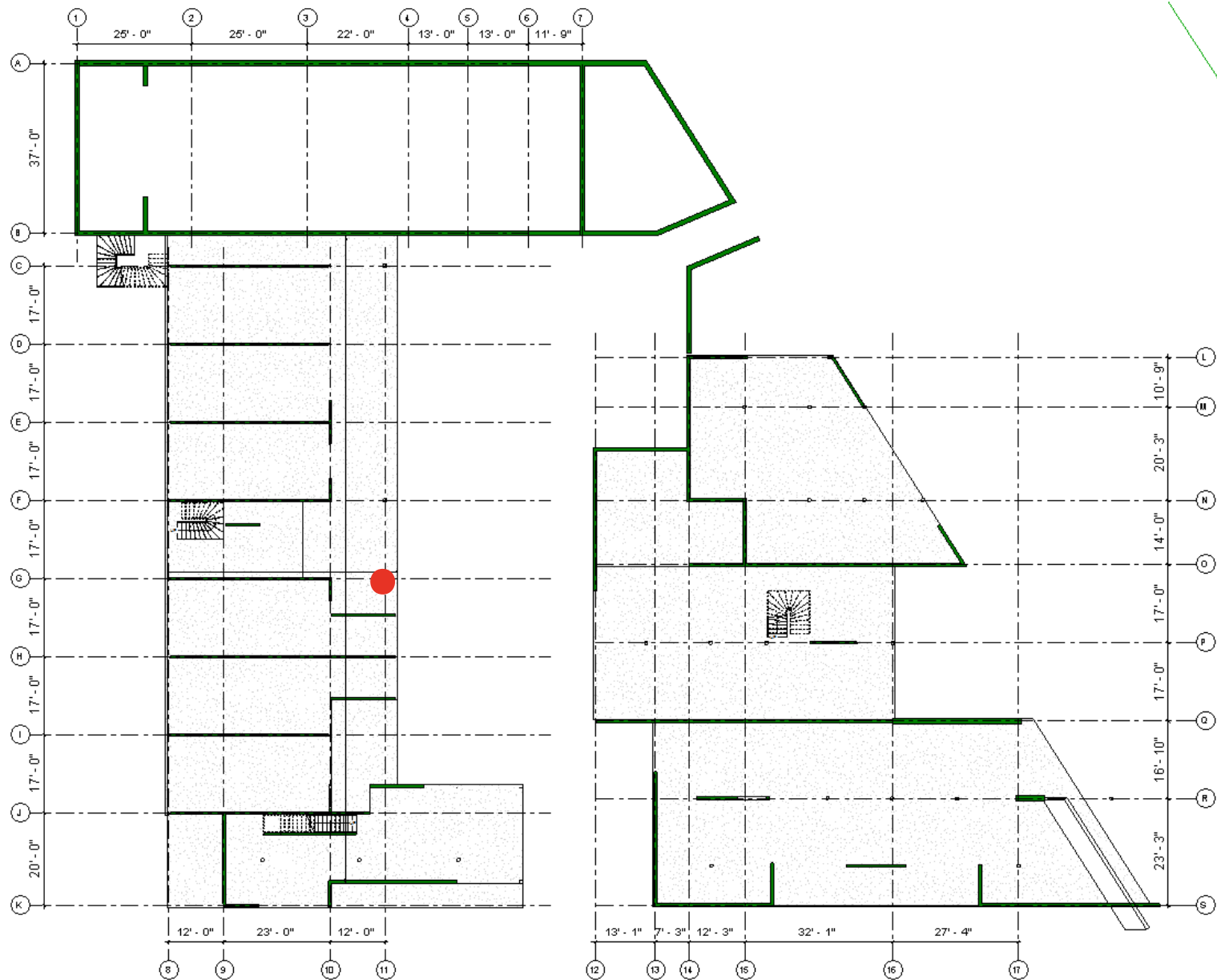
$876.4 d^2 + 23661.6 d - 44,000 = 0$

$d = 1.75 \text{ ft} = 1'9"$

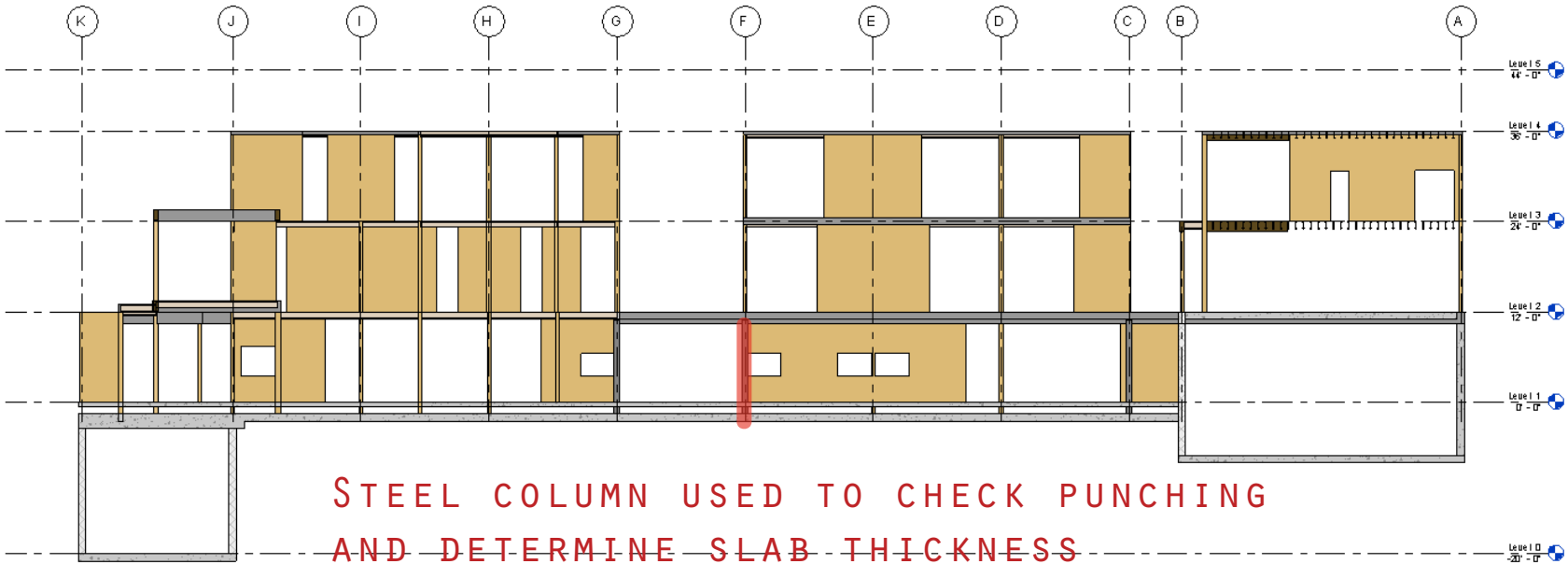
USE $d = 2' = 24" > 21" \checkmark$

MAT FOUNDATION TO BE 3'± N.W.C.

24" DEEP W/ #4's @ 12" O.C. E.W. (ASSUMED)



STEEL COLUMN USED TO CHECK PUNCHING AND DETERMINE SLAB THICKNESS



STEEL COLUMN USED TO CHECK PUNCHING AND DETERMINE SLAB THICKNESS

2115 BROAD

Norberto Larios & Nick Gasparini | Proffesor Stacey White & Brent Nuttall
Arch 453 + Arce 415



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[dear client]

N&N would like to extend our gratitude in the opportunity to present our design proposal. As one of the oldest professions in history, Architecture has been powered by creativity and zealous for the beautiful. We at N&N take this idea to heart, as an interdisciplinary team we looked at the project from different points of view and look for the best solution to both your needs and those of the project.

In collaboration with you we will work together to find a design solution that fits your requirement, the city's and the better living of the occupants to be.

N&N thanks you once again for the opportunity to present our design proposal, and look forward to the prospect of work with you.

Sincerely,

N&N

[executive summary]

Our client, a local developer seeks to design and build a mix-use project which addresses the housing need that San Luis Obispo currently undergoes. The project will not only provide much need it living units, but it will further the neighborhoods economic growth by providing new businesses that will on account provide more jobs.

2115 Broad St. is located in the Railroad District of San Luis Obispo, just a minutes from Downtown. Its proximity will provide the occupants and neighboring community relative close access to its proposed program. Part of our goals for the project was to provide as large amount of housing without sacrificing open space and the quality of living, our proposed design consists of a total of 21 units with a density value of 23.8. The proposed design also includes 2 large offices with a shared lobby area, 3 restaurants/café, a small grocery store serving the neighborhood, as well as shared spaces for the residents in which events and other community activities could take place.

As an interdisciplinary design team smart and structural integration to the design occurred from the beginning. Timber framing for all structures above grade, OSB sheathing is to be used for all floors and walls. Floors are supported by TJI joists and PSL beams, framing members are supported by bearing walls in the residential structures and supported by a mix of bearing walls and interior columns within the retail and office structures. Underground parking is all concrete construction. Parking structures support some of the timber construction above. All structures are supported by mat foundations that are stepped with the change in elevations. Timber shear walls are used as lateral support for timber framing, while concrete walls act as bearing and shear walls below.

[client project goals]

Each city and site is different from one another, each with their own set of attributes and issues. 2115 Broad St, San Luis Obispo is no exception. Known to many as the “happies city” it has its own problems, the city’s job and housing balance causes most people to commute from the surrounding cities. As if scarcity of housing was not a big enough problem the affordability and challenge of access to jobs that can satisfy a living is an ongoing problem.

A locally active developer has recently acquired a property near downtown with plans to purchase two nearby parcels as well. Asked to propose a project and complete detailed design for its highest and best use. The developer has certain goals that they want to be achieve in order for the development of the site to be feasible.

Project Program

The developer has completed a preliminary assessment (financial and market analysis but not entitlement) and asks that the following minimum program elements be included in the project:

- Two (2) restaurants and/or café
- Three (3) small offices with shared support amenities (restroom / breakroom)
- Two (3) three bedroom units
- Three (2) two bedroom units
- Two (2) one bedroom units
- Uncopiable roof deck with shared garden area
- Maximize common area for resident and office use
- All required residential and office vehicle parking should utilize high density mechanized parking. Any and all parking reduction possibilities should be explored.
- Bicycle parking for 50% of residential and office occupants, 20% of restaurant visitors
- Living Building Challenge petal certified (Water, Energy, Beauty)
- Four 2 bedroom units
- One small neighborhood serving grocery/café
- Two small offices
- Three studio apartments

[project intent and design approach]

From the first occurrences of human made spaces; space making through the manipulation of the environment as was with the creation of fire, architecture performed beyond its utilitarian properties. Architecture provides an experience in which the occupants participate on an immersive level.

This idea however can be a double edge sword, as designers have to create an immersive experience while not separating the outside world from the experience of the occupant and creating a relationship between the building design and the neighborhood it exists in. Architecture is a public art experience with distractions and noise in a public setting, its physicality is as important as metaphysical properties the architect is able to bring forth. The architecture of the proposed design solution must therefore consider the current and future context in which the building will have to perform.

2115 Broad St. is not only a complex site today, but as the city moves forward and so does its architecture the context which surrounds it will become more complex. N&N's goal is to create a balance at which the occupants can immerse themselves not only in this particular building but within the surrounding neighborhood that they are a part of.

Manipulating the design to create a building that allows for the maximum connection of the community while maintain the need for privacy of its occupants. The location of the site allows for fantastic views of both the city and the hills that characterize the City of San Luis Obispo. The new building must also be able to perform in terms of architectural design and systems integration. Creating a project that not only responds to the needs and wants of its occupants but does so responsibly, by minimizing its environmental impact on its own community.

The different programmatic uses of the building defined the approach in regards to site layout, our goal was to provide the residents a variety of spaces to enjoy individually but bringing the community together, this to ignite a more social community.

The more public program was then pushed towards Broad St. to protect the residential units and open spaces from the more busy street. The topography of the site also influenced the manipulation and how public space was handled. The 10ft elevation difference between the southern most part of the site and the northern end, provided the opportunity to excavate the site and protect the public courtyard even more. This also allowed for a taller building without surpassing the neighborhood's high tolerance.

Vulkanen - energy neutral youth housing

architect

Terroir, Cubo
Arkitekter A/S

location

Grete Løchtes Gade 7
Aarhus, Denmark

project year

2013

building area

2700.0 sq ft

client

Ringgården Housing Association

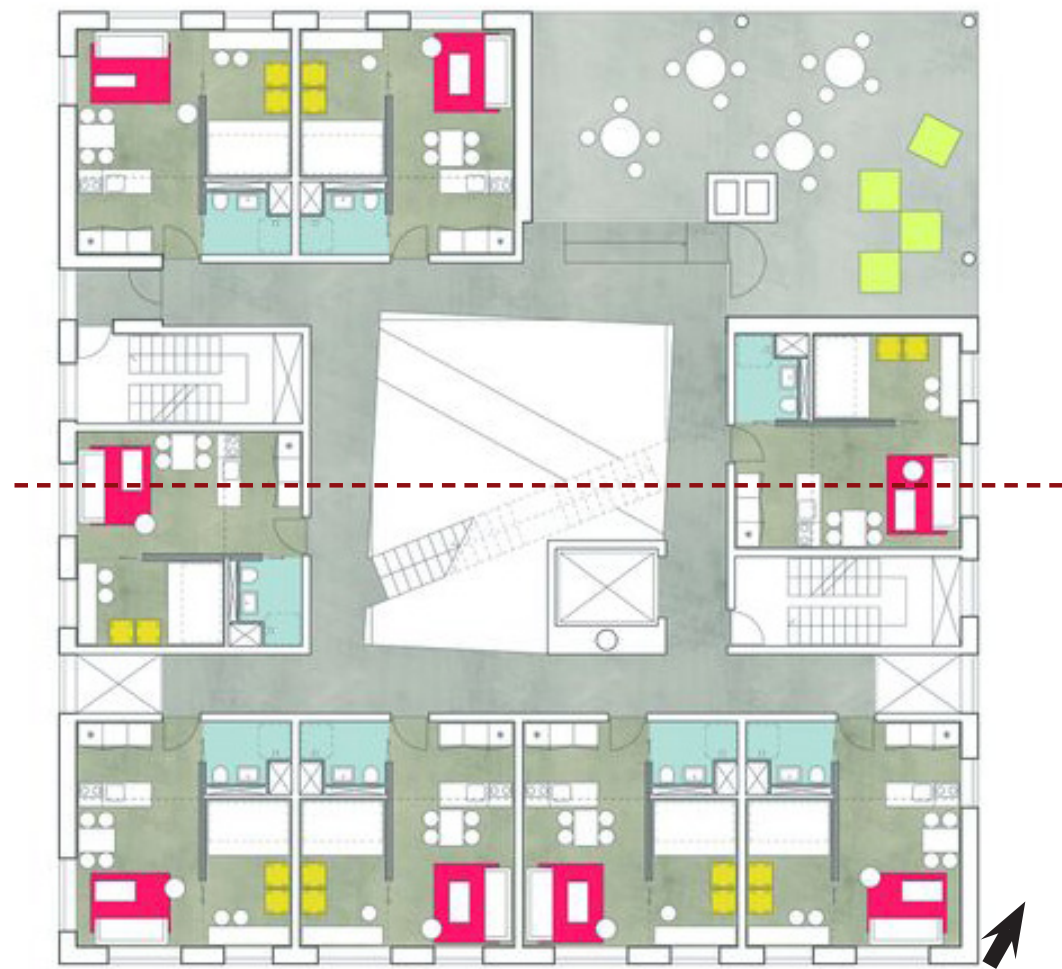


Vulkanen is a seven story apartment complex that serves as student housing. The edifice attempts to demonstrate an architectural cooperation between a building's character and layout.

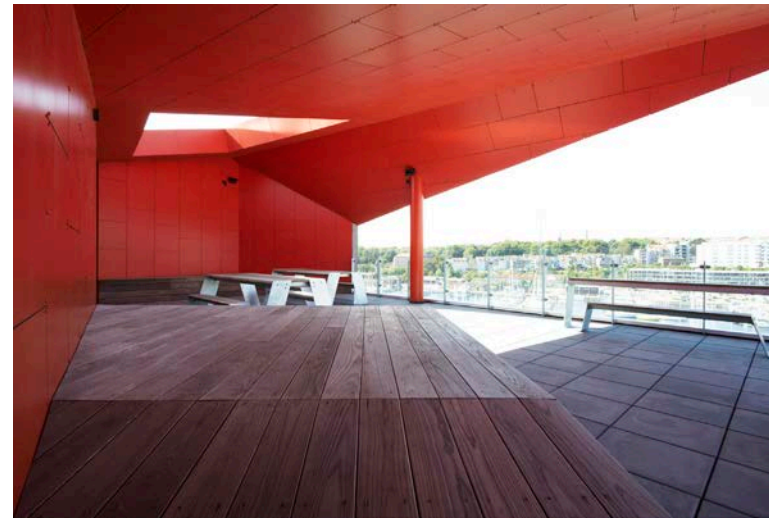
This project demonstrates simple design techniques that can bring a complex integration of sustainable design and architectural solutions to our own projects.

The approach of systems thinking, creates a symbiosis of the material choice and sustainable design with façade design and architectural planning

Both the buildings cubic form and interior program layout are an integral part of the energy-efficient design of Vulkanen. The cubic design ensures compact volume while allowing the maximizing quality of views for all residents.



A design choice of the architects was to include the atrium and circulation space as the core of the building. By then heating this atrium to 70 °F (20 °C), this helps the building use less energy for heating.



Vulkanen, although not a mixed use building as the one we are designing. Balances the different programmatic implications of medium density housing with that of high quality of living and a more active and unique life style of student living. This project demonstrates how implementing simple programmatic choices can have a great impact both design and sustainability. By bringing together the architecture and sustainability at an early stage of design we can make better buildings that perform much better.

"Energy neutral youth housing at the Port of Aarhus / CUBO Arkitekter + TERROIR" 20 Mar 2014. ArchDaily. Accessed 1 Apr 2016. <<http://www.archdaily.com/487764/energy-neutral-youth-housing-at-the-port-of-aarhus-cubo-arkitekter-terroir/>>

"Cubo." Cubo. Web. 02 Apr. 2016. <<http://cubo.dk/>>.

[project goals]

“As time went on, the thickly crowded trees in a certain place, tossed by storms and winds, and rubbing their branches against one another, caught fire, and so the inhabitants of the place were put to flight, being terrified by the furious flame. After it subsided, they drew near, and observing that they were very comfortable standing before the warm fire, they put on logs and, while thus keeping it alive, brought up other people to it, showing them by signs how much comfort they got from it.”

-Vitruvius, The Ten Books of Architecture

At N&N our goal is not only to satisfy the clients proposed program requirement, but to really look at the site and at what is trying to accomplish by the development. The area around 2115 Broad St. is one that will continue to grow and become more and more complex. As such our goal is for our proposal to not only stand tall with the needs of the occupants and client, but to the future of the community. By proposing a project that will not only respect the current ascetics of the community but it reminiscent of the historic values that surround the site.

[site analysis]

SITE HISTORY

HISTORY OF SAN LUIS OBISPO BREAKDOWN

- founding of San Luis Obispo de Tolosa (1772)
- development of the railroad (1874)
- founding of Cal Poly (1901)

When the railroad was being built, the area around it began to develop with buildings offering services related to the railroad. However, railroad related buildings soon disappeared due to abandonment or neglect and some converted to other uses as time changed and the city began to populate and develop.

Soon the railroad district was rezoned from service commercial (C-S) to General Retail (C-R) as the city began to grow into a concentration of retail, restaurants and office.

The district had a slow and steady development - fire station was built in the 90s and there was improved railroad facilities. The area contains historic areas and buildings now in poor condition but history wants to be continuously preserved in this district as it was a huge impact in transportation as the city developed.



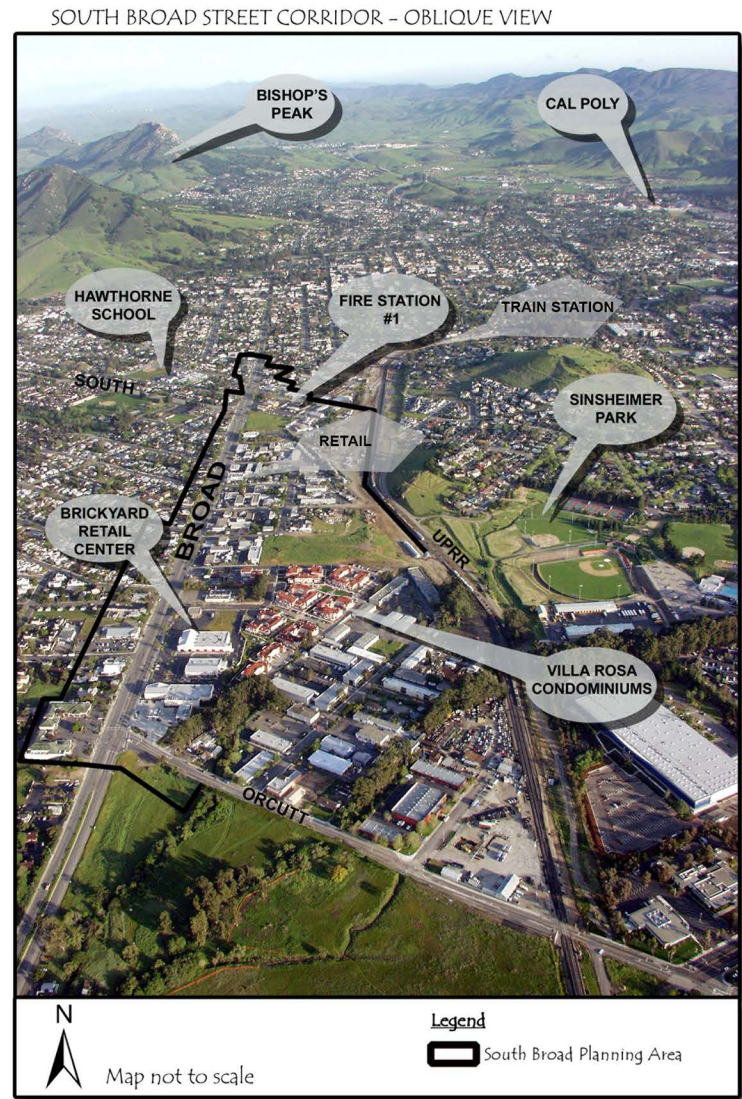
A view of the rear of the Roundhouse, looking east with Santa Barbara Street in the foreground.



An aerial photograph, taken in 1997, showing Railroad Square, the depot, the parking lots and a portion of the tracks.

The railroad district was and is a highly diverse area that has light industrial, retail, office, residential, recreation and transportation uses meet in a relatively compact geographic area.

SOUTH BROAD STREET VERNACULAR VIEW



COMMERCIAL - RESIDENTIAL



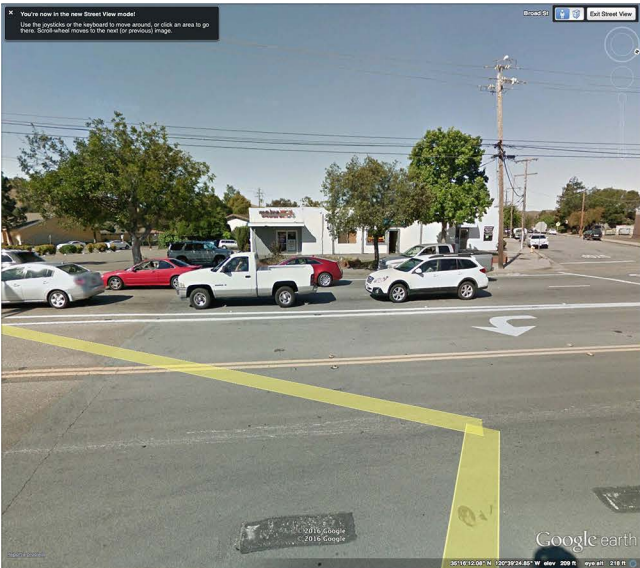
FUTURE DESIGN PLAN



COMMERCIAL - RESIDENTIAL



AREA AROUND THE SITE CONTEXT



South Broad Street Cultural Context



source: Rick Engineering
(SLO South Broad Street Area Plan)

The site is located within the South Broad Street Area neighborhood, which is bounded by High Street, Union Pacific Railroad, Orcutt Road, and Broad Street on the four cardinal directions, respectively. Located in the center of the city, this neighborhood is adjacent to Highway 101, Downtown San Luis Obispo, the Historic Railroad District, and Little Italy.

Not only was the southerneast portion of the city one of the oldest residential neighborhoods, it was once home to many Italian-Americans and railroad workers (hence the name Little Italy). Many of the original dwellings remain, but renovations in the past century has increased the number of commercial, light industrial, waste recycling, auto sales, auto repair, and other uses and businesses.

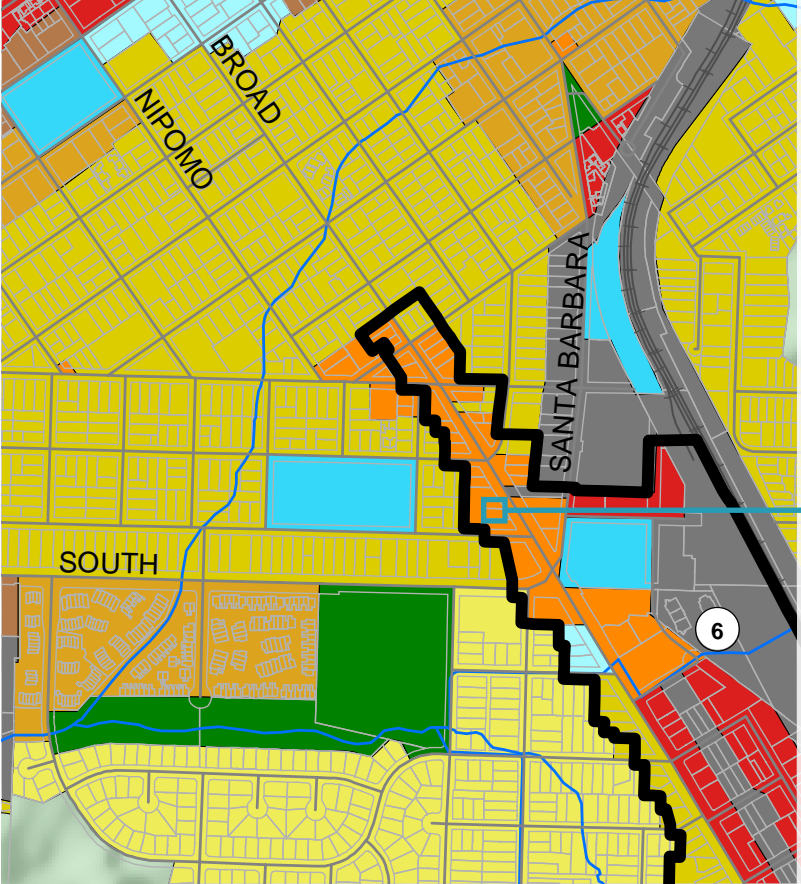
Since Broad Street is a main transportation corridor that runs continuously to from Downtown San Luis Obispo down south to Arroyo Grande, Pismo Beach, and Grover Beach, the area is close to many shopping stores (and plazas), schools, employment centers, and major transportation facilities like public transit stops, the county regional airport, and Amtrak Train Station.

Although the area offers quite diverse programming and adjacencies to different parts of the city, it is not in an ideal situation to promote any real connection.

The street design allows for high traffic volumes, relatively high speeds, and continuous, uncontrolled left turns into streets and driveways, making it difficult for residents to access businesses, adjacent neighborhoods, schools, parks, and public transit that is present in the area. Traffic volumes on Broad Street, up to 29,100 vehicles per day in 2010, discourage most, if not all, pedestrians and bicyclists from crossing the streets. The lack of continuous sidewalks, street trees, and crosswalks does not facilitate for an active pedestrian community.

This area currently houses various types of buildings and programs. Along with the mixed-density residential, small-scale retail and restaurants, there are plenty of manufacturing and industrial services along the street, including parts that were originally developed in the Imperial Addition (1888). The neighborhood originally consisted of railroad workers' small houses with simple designs. Over time, zoning changed and non-residential uses appeared while most of the old neighborhood was demolished. The few remaining homes from that period is located between Humbert Avenue and Woodbridge Street.

In 2012, the South Broad Street area has been described as a neighborhood in transition with funky, diverse, and/or dilapidated culture due to the mix of older commercial and residential buildings, lack of public facilities, and underutilized properties.



2115 Broad St

Land Use Designation
Neighborhood Commercial | C-N

Zoning Regulations
Density
Average Cross-Slope

	Maximum Density Allowed (density units per net acre)					
	R-1	R-2*, O, C-N, C-T	R-3	R-4	C-R, C-D, C-C	C-S, M
0-15	7	12	18	24	36	24
16-20	4	6	9	12	36	24
21-25	2	4	6	8	36	24
26+	1	2	3	4	36	24

Density Bonus
(low/moderate-income housing)

Percentage Moderate-Income Units	Percentage Density Bonus
10	5
11	6
12	7
13	8
14	9
15	10

Occupancy Standards | C-N
25 max population density/net acre
12 density units/net acre

Development Standards
Maximum Heigh: 35 feet
Maximum Coverage: 75%
Maximum floor area to site ratio: 2.0

Building Setback Lines
Broad Street
40ft from centerline of Broad St

Parking

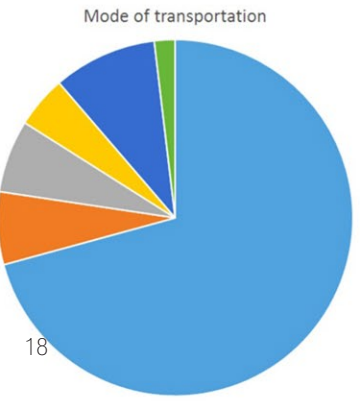
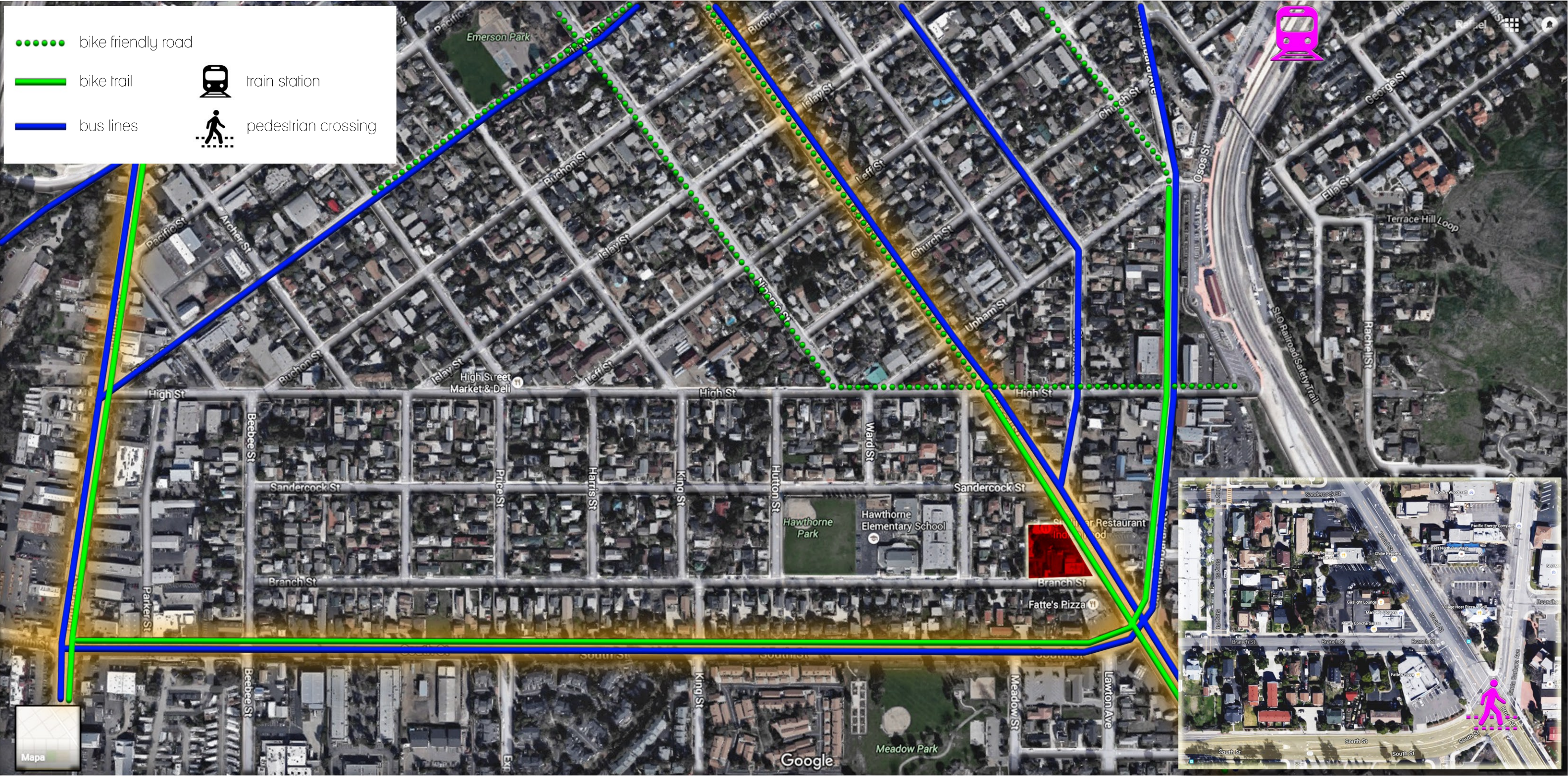
Live/work Units	2 spaces per unit
Mixed-use	Same as Multi-family
Multi-family	1 per studio apartment, 1-1/2 for first bedroom plus 1/2 for each additional bedroom in a unit, plus 1 for each five units in developments of more than five units
Bakery, retail	One space per 200 ft ² gross floor area
Convenience store	Two spaces for employee parking, plus one space per 500 sq.ft of gross floor area and a minimum of five bicycle parking spaces
Retail ≤2000 ft ²	One space per 300 ft ² gross floor area
Bicycles, retail	One space per 500 ft ² gross floor area
Restaurant	One space per 60 sq. ft. customer use area, plus one space per 100 sq. ft. food preparation. Walls, halls, restrooms, and dead storage areas do not count as either customer use or food preparation floor area
Office - Accessory	As required for principal use
Office - Business	One space per 300 ft ² gross floor area

Bicycle Parking

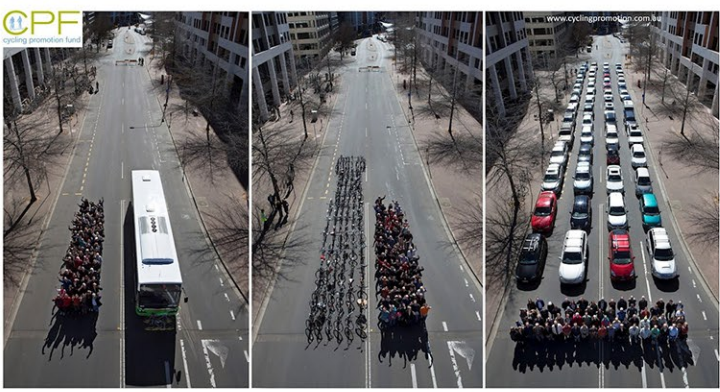
	Spaces as a percentage of required auto spaces*	Minimum short-term bicycle spaces**	Minimum long-term bicycle spaces***
C-N	15%	50%	40%

* Requirements apply to uses that require 10 or more vehicle parking spaces. When less than ½ space is calculated, one space is required
** “Short-Term” bicycle parking is used by visitors to multi-family housing and by patrons of commercial uses. Bicycle racks are used to satisfy this need
*** “Long-Term” bicycle parking is used by employees of commercial uses and by residents. Fully enclosed lockers are used to satisfy this need. Lockable rooms reserved for bicycle storage and secured parking areas managed by attendants are other acceptable forms. Bicycles shall be parked vertically or horizontally with at least the rear tire resting at floor level. Additionally, bicycle lockers or interior space within each dwelling or accessory structure have to be provided for the storage of at least two bicycles per unit

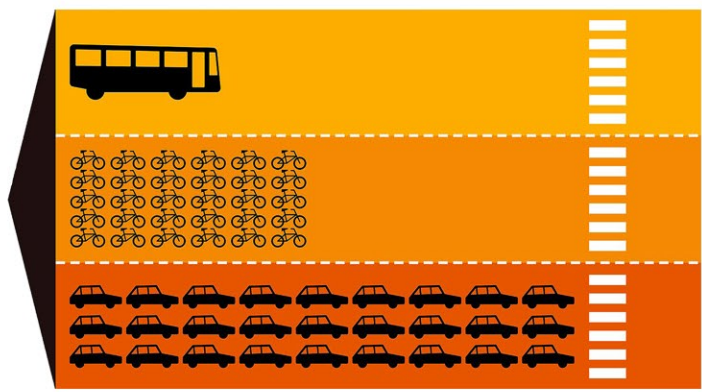
Site Analysis_Transportation



- car (alone)
- bus
- bicycle
- walk
- carpool
- other



30



Increase the percentage of all trips made by bicycle within San Luis Obispo. Establish and maintain an integrated system of bikeways and parking facilities that enables safe and convenient bicycling, with an emphasis on travel to employment centers, commercial districts, schools and recreational destinations.

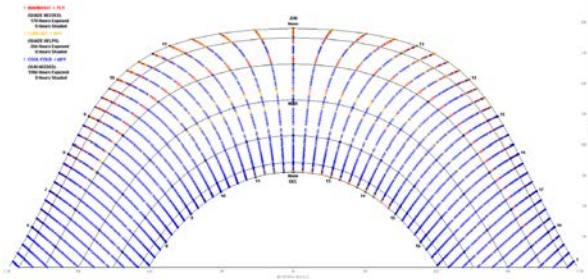
Advocate bicycling as a way of addressing climate change, preserving clean air, reducing traffic congestion and noise, conserving land and energy resources, and promoting good health.

Develop financial partnerships with other organizations when the resultant bicycle facilities or activities provide significant benefits to San Luis Obispo residents.

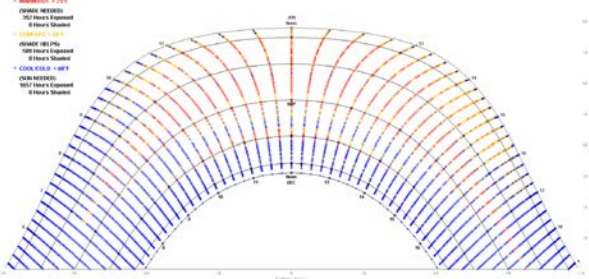
AVERAGE TEMPERATURE

	Jan	Feb	March	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
Average High °F	64	64	65	69	72	75	77	80	79	76	70	64
Average Low °F	41	42	44	45	48	51	54	55	54	49	44	40
Average Precipitation inches	3.66	3.66	3.19	1.1	0.39	0.08	0.04	0.04	0.2	0.87	1.73	4.06

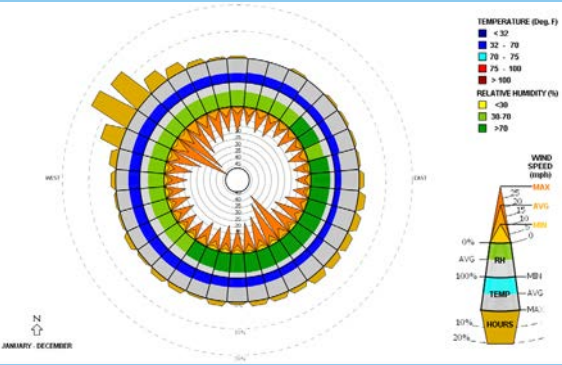
SUN SHADING CHART WINTER - SPRING



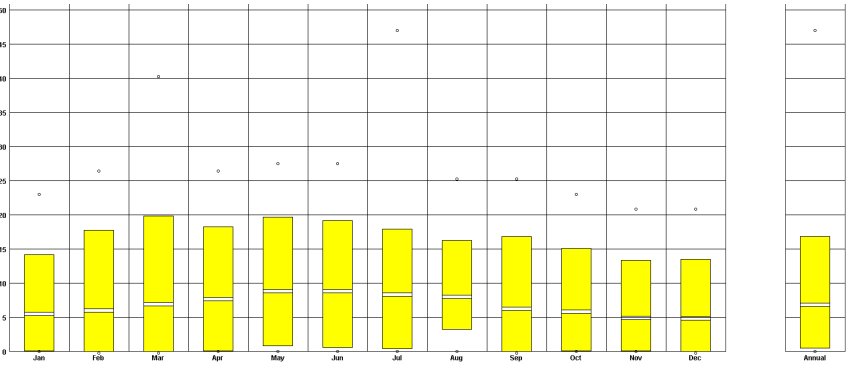
SUN SHADING CHART SUMMER - FALL



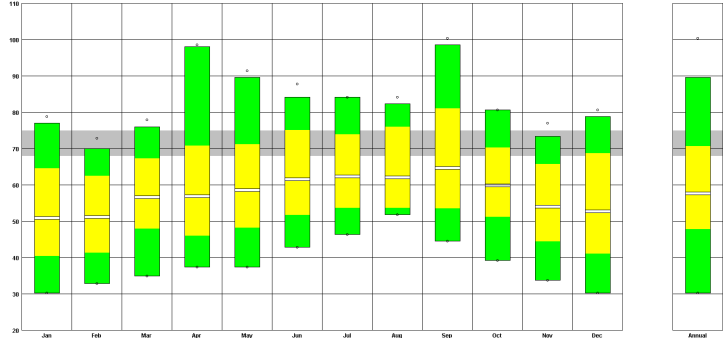
WIND ROSE



AVERAGE WIND VELOCITY

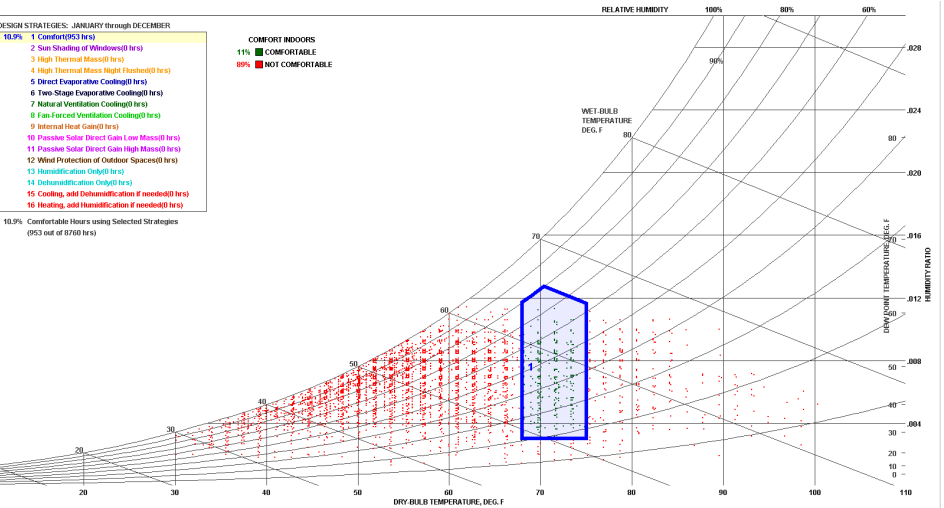


AVERAGE TEMPERATURE

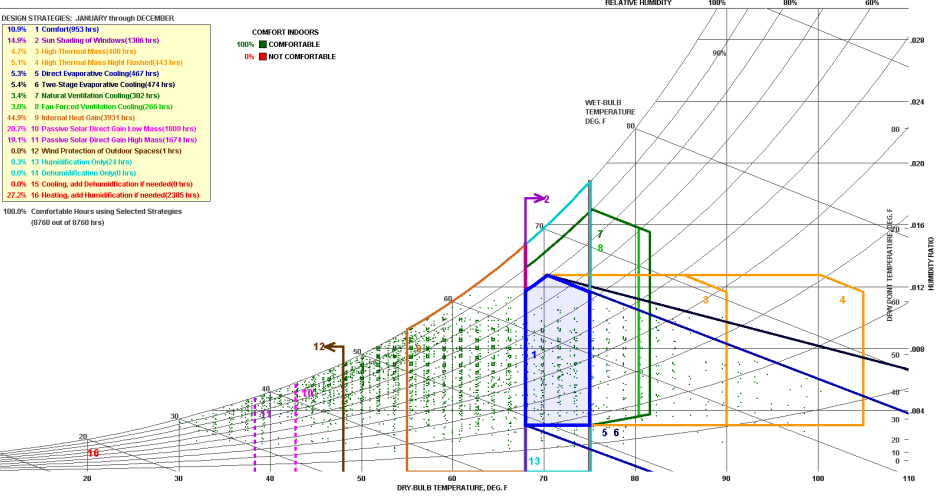


CLIMATE ANALYSIS
SAN LUIS OBISPO, CA

PSYCHROMETRIC CHART (WITHOUT STRATEGIES)



PSYCHROMETRIC CHART (WITH STRATEGIES)



Most of the wind direction is W - NW throughout the year.

During Fall and Winter the wind also has a E - SE direction

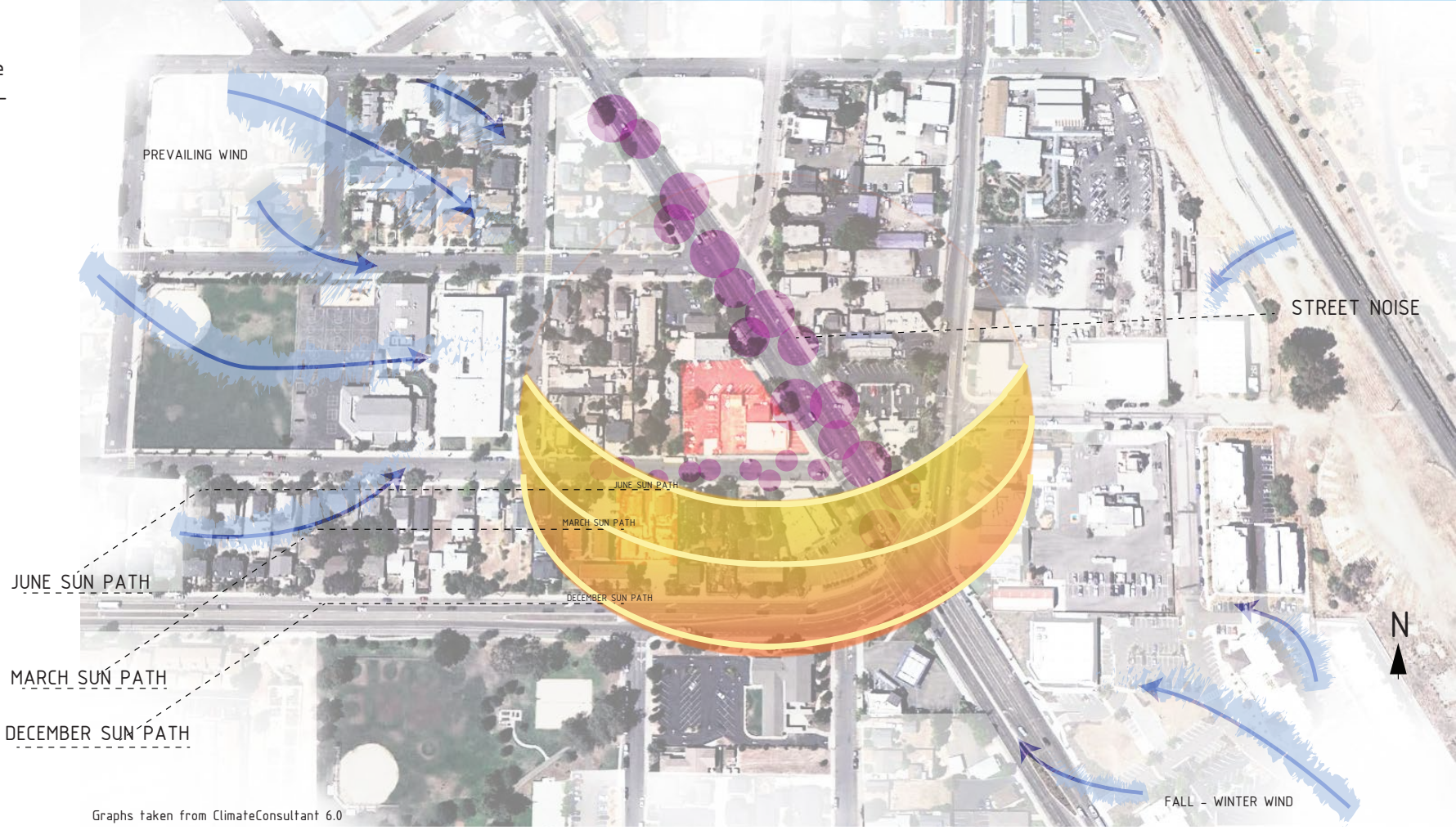
SLO is sunny most of the year.
some strategies:

- Passive solar heating
- Entrance of winter light
- Summer shading
- Natural Ventilation

Precipitation in San Luis Obispo is higher during winter and early spring.

Most of the noise comes from Broad street.

SUN PATH + WIND + NOISE



Graphs taken from ClimateConsultant 6.0

SEISMICITY

FAULTS

- Los Osos Fault Zone
- West Huasna Fault Zone
- Oceanic Fault Zone



<http://maps.conservation.ca.gov/cgs/fam/>

SOIL TYPE

SITE SOIL CLASSIFICATIONS: Site Class D - "Stiff Soil"

LOS OSOS FAULT

TYPE OF FAULT

normal, reverse, and thrust faulting all represented within the zone

LENGTH

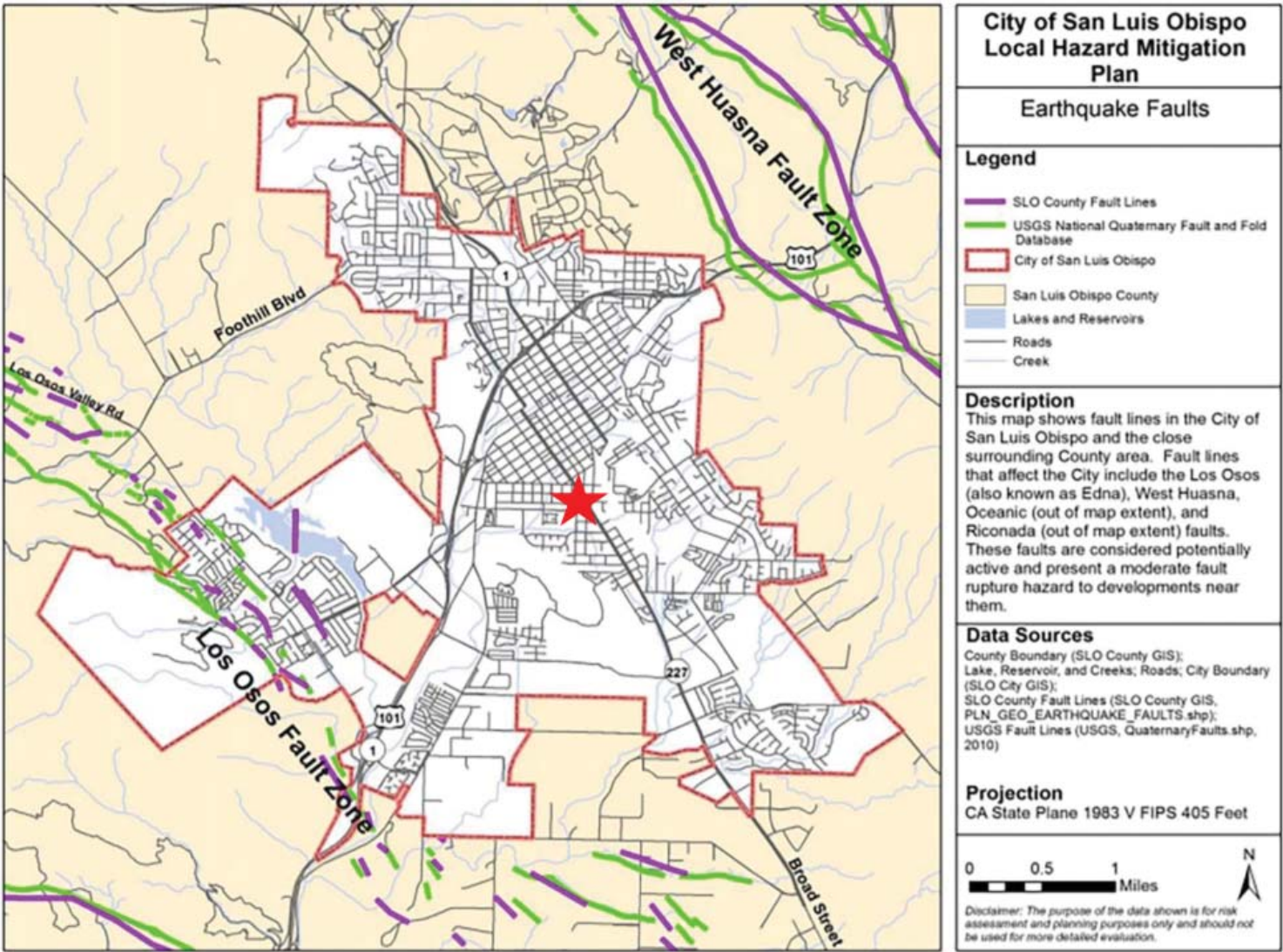
about 45 km

NEAREST COMMUNITIES

Los Osos, Edna, and San Luis Obispo

PROXIMITY TO SITE

~8,000 feet away



<http://www.slocounty.ca.gov/Assets/OES/Plans/Hazard+Mitigation+Plan+2011.pd>

SEISMICITY

SEISMICITY HAZARDS

SURFACE RUPTURE

Surface rupture can endanger lives and property when structures or lifeline facilities are located on, or near, a fault. The Los Osos Fault is one of the closest active fault to the San Luis Obispo area, located near the intersection of Los Osos Valley Road and Foothill Boulevard. It has been classified as active within the last 11,000 years.

GROUND SHAKING

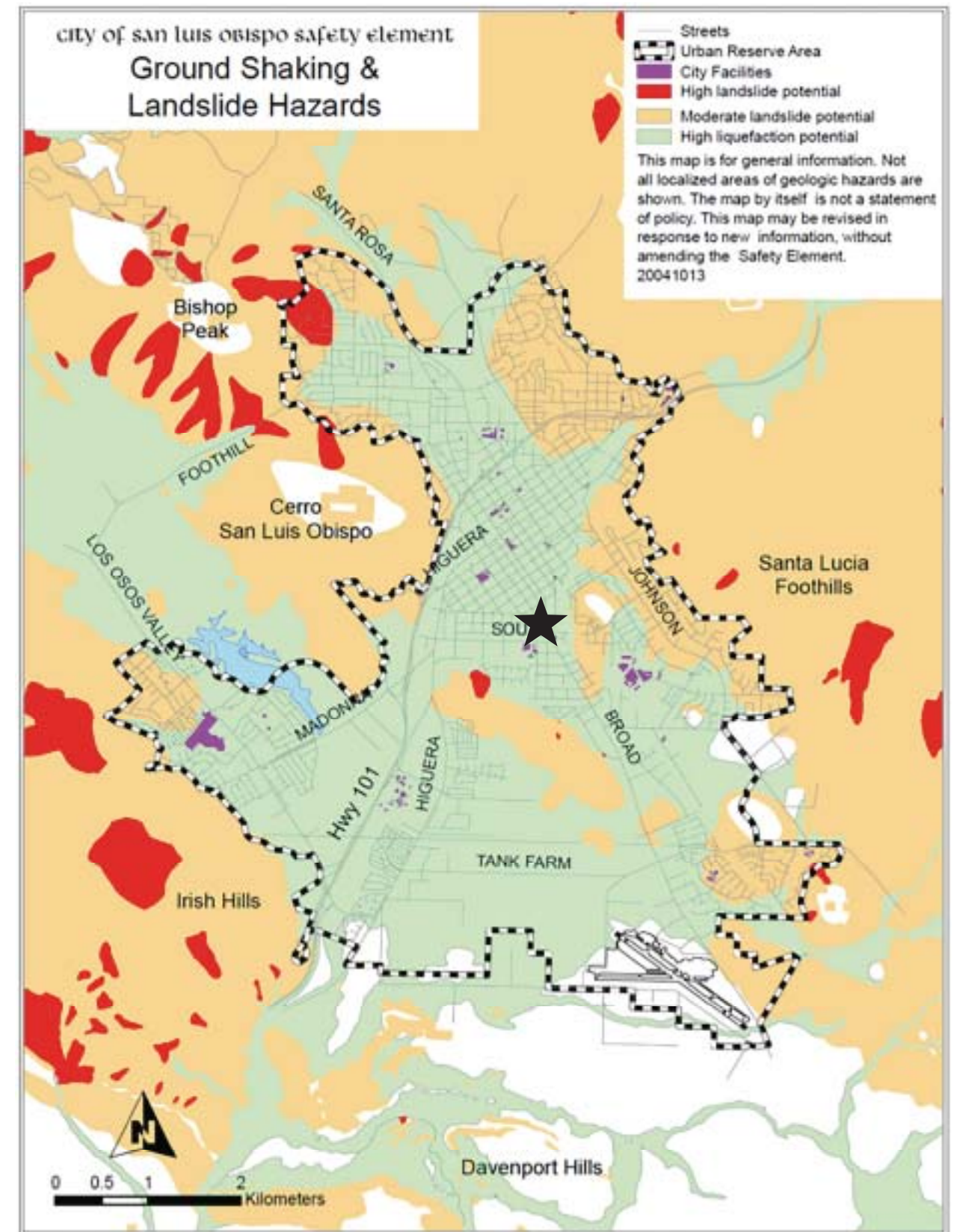
Shaking can endanger lives and property by damaging or destroying structures and essential lifeline facilities. In San Luis Obispo, many faults are capable of producing strong ground motion. The San Andreas Fault and the Oceanic Fault are the most likely source of ground shaking for the San Luis Obispo area and are most likely to produce a substantial earthquake within an average lifespan.

SETTLEMENT AND LIQUEFACTION

Liquefaction is the sudden loss of the soil's supporting strength due to ground-water filling and lubricating the voids in the soil as a result of ground shaking. In extreme cases of liquefaction, structures have the ability to tilt, break apart, or even sink into the ground. The soils in the San Luis Obispo area are the most susceptible to settlement and liquefaction due to underlain alluvial soils where shallow groundwater is located.

SLOPE INSTABILITY AND LANDSLIDES

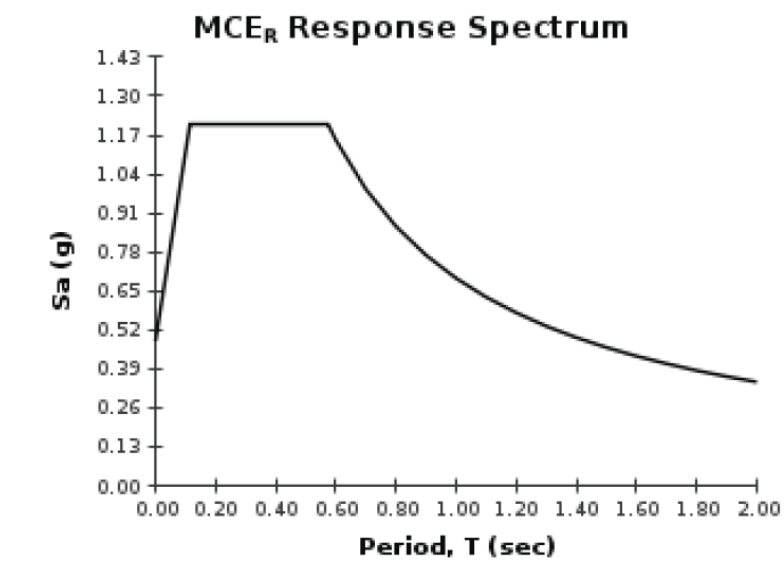
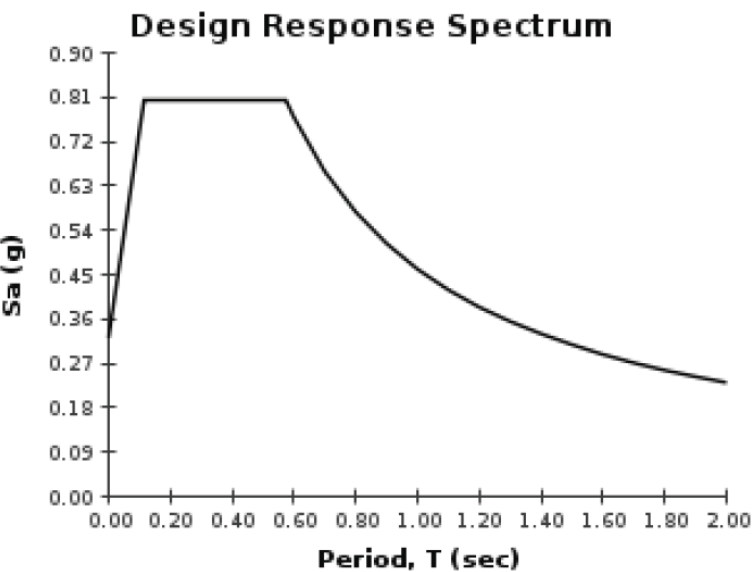
Slope instability may result in gradual or sudden damage to buildings, roads, and utility lines. Much of the development in San Luis Obispo is in valleys, where there is low potential for slope instability. However, the city contains extensive hillsides. Several are underlain by the rocks of the Franciscan group, which is a source of significant slope instability.



<http://www.slocity.org/home/showdocument?id=2254>

SEISMICITY

RESPONSE SPECTRA PROPOSED

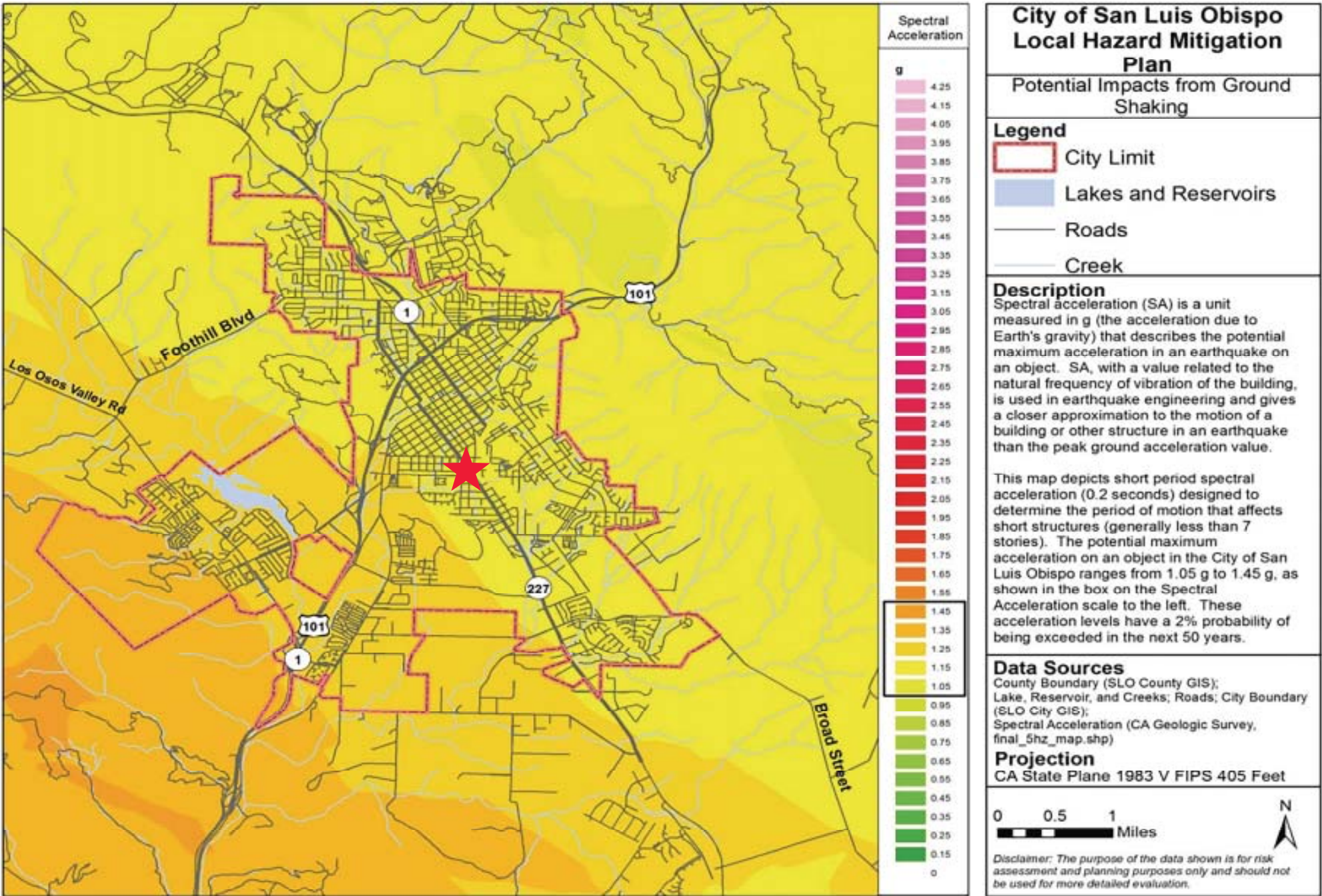


<http://earthquake.usgs.gov/designmaps/us/application.php>

USGS–Provided Output

$S_s = 1.168\text{ g}$	$S_{MS} = 1.206\text{ g}$	$S_{DS} = 0.804\text{ g}$
$S_1 = 0.445\text{ g}$	$S_{M1} = 0.692\text{ g}$	$S_{D1} = 0.461\text{ g}$

<http://earthquake.usgs.gov/designmaps/us/application.php>



<http://www.slocounty.ca.gov/Assets/OES/Plans/Hazard+Mitigation+Plan+2011.pdf>

APPENDIX: SEISMICITY

Fault Notes

Seismicity Hazards Notes

Response Spectra Notes

Surface Rupture

Additional site-specific studies may find other segments of the fault, in which case it would be appropriate for the California Department of Mines and Geology to expand the zone.

Ground Shaking

Engineering standards and building codes set minimum design and construction methods for structures to resist seismic shaking.

Settlement and Liquefaction

The actual risk of settlement or liquefaction needs to be identified by investigation of specific sites, including subsurface sampling, by qualified professionals.

Slope Instability and Landslides

The actual risk of slope instability needs to be identified by investigation of specific sites, including subsurface sampling, by qualified professionals. The building code requires site-specific investigations and design proposals by qualified professionals in areas that are susceptible to slope instability and landslides.

ENGINEERING SITE ANALYSIS

FOUNDATIONS



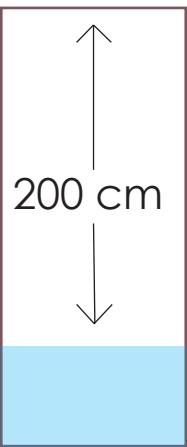
SITE SOIL CONDITIONS

Bearing	1000 psf
Lateral passive	100 pcf
Friction	130 psf
Equiv. Fluid Pressure	40 pcf
Expansion Index	126 (High)
Soil Classifications	Clay (CH)
Per Table 18-I-A of the 1997 UBC	
Soil Class	D
Land Capability Class	3e

SECTION OF SITE



WATER TABLE



POSSIBLE FOUNDATION TYPES

PAD FOOTINGS: Clays expand and contract, which may cause pad footings to shift. Also, with a quick calculation, we can see that the size may be far too large for this type of footing to be considered.

CAISSONS: Caissons are cast in place, and therefore do not require driving equipment. They also can take large loads, and are not affected by the clay, making them a reasonable choice.

PILES: Piles require hammers, which can be disruptive to surrounding occupancies. So although they may work for the site once in place, they should be avoided for this project.

MAT FOOTINGS: Mat footings are more resistant to the swelling of clay, and can take large amounts of load. They also can serve as a slab on grade. This is another reasonable option for the project.

ISSUES AND CONSTRAINTS

A high expansion index means we need to be careful that rain will not collect around the perimeter of the building. This could cause the soil to swell and put excess load on foundations and bearing walls.

The USDA site also states that the soil in our area has moderate corrosion of concrete and steel, something to keep in mind when designing underground elements.

ENGINEERING DATA FOR FOUNDATIONS

All footings shall bear 27" minimum to natural grade. Slabs on grade shall be a minimum of 4" thick and above 4" of clean sand.

WATER TABLE

A subsurface creek may run through adjacent parcels. Exact location has not been determined but may need to be accounted for

ENGINEERING SITE ANALYSIS

FOUNDATIONS

EXPANSIVE CLAY:

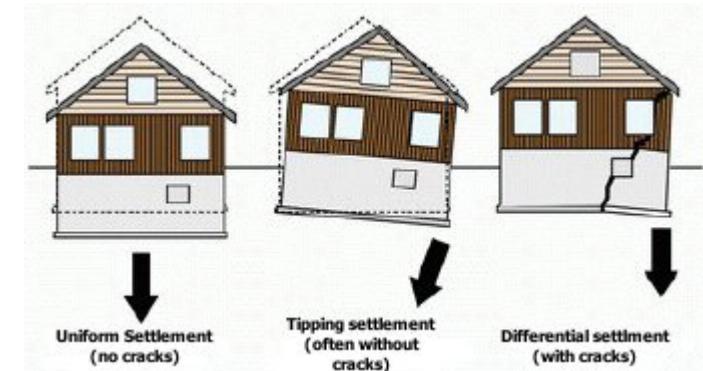
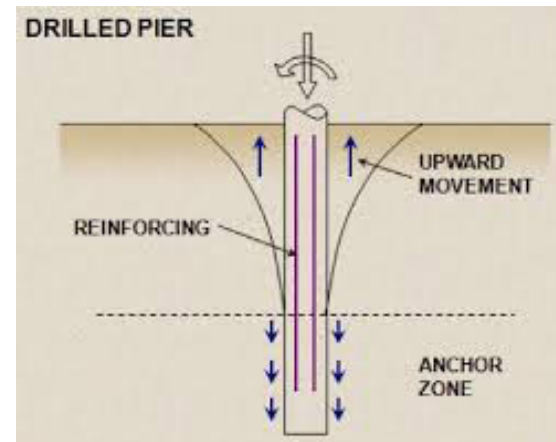
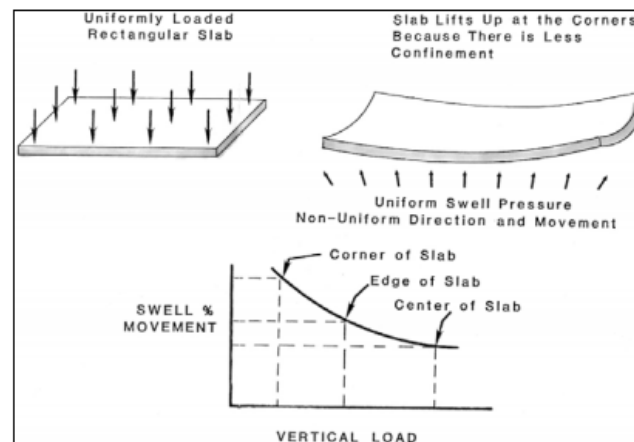
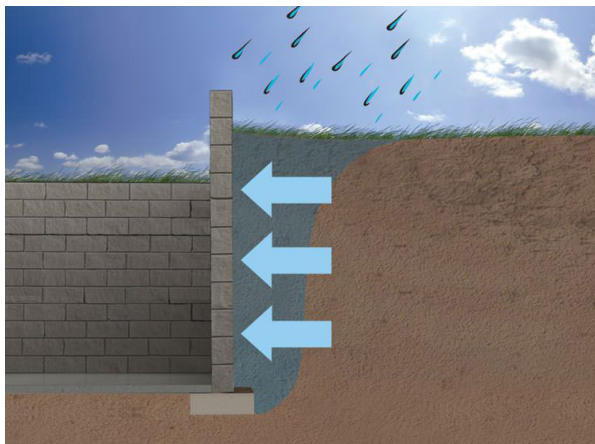
Soil type which expands with the addition of water, may cause structural damage to foundations or retaining walls

DESIGN STRATEGIES:

For piles - may want to pre-wet the soil in order to account for the highest expected level of expansion, but when soil shrinks, piles will still be able to withstand loads

For slab-on-grade/mat foundation - post-tensioning of steel in the slab will make the slab stiffer and therefore, less likely to crack, building will then be able to move as one object

POTENTIAL PROBLEMS:



APPENDIX

REFERENCES

USDA Natural Resources Conservation Service
<http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx>

Foundation Repair Guide
<http://www.foundation-repair-guide.com/expansive-soil.html>

ENGINEERING DATA

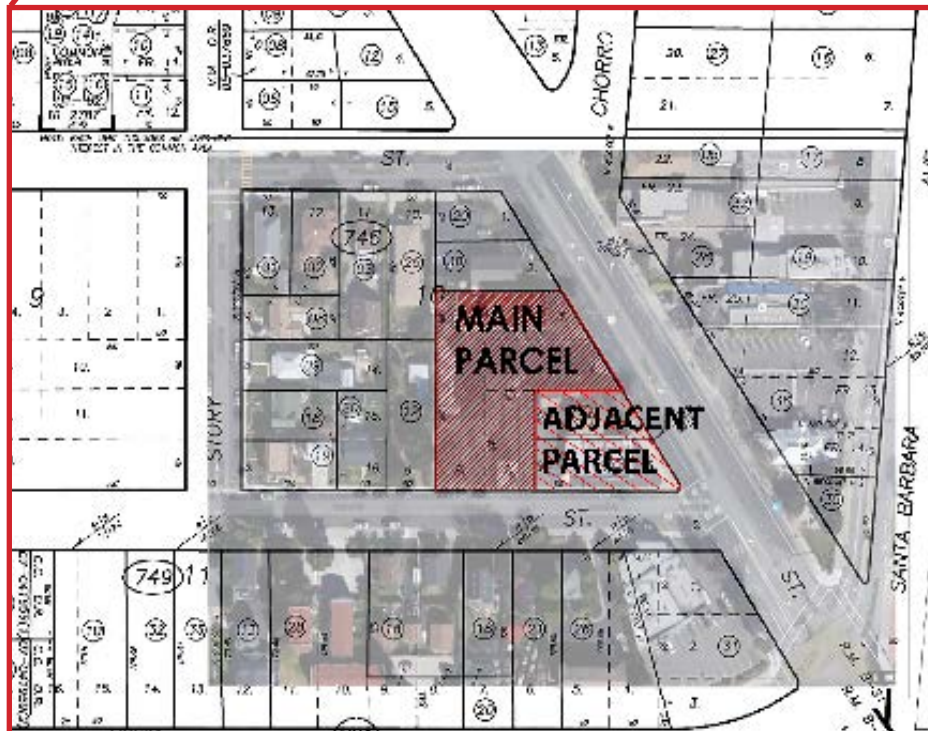
All footings shall bear 27" minimum to natural grade.

Slabs on grade shall be a minimum of 4" thick and above 4" of clean sand, and should have #4 @ 18" o.c. each way at mid-depth.

Site has 5-9% slope.

EXCAVATION

SITE LOCATION



LOT DIMENSIONS



EXCAVATION

VIEW FROM BRANCH STREET



VIEW FROM BROAD STREET



SKY VIEW OF SURROUNDING SITE

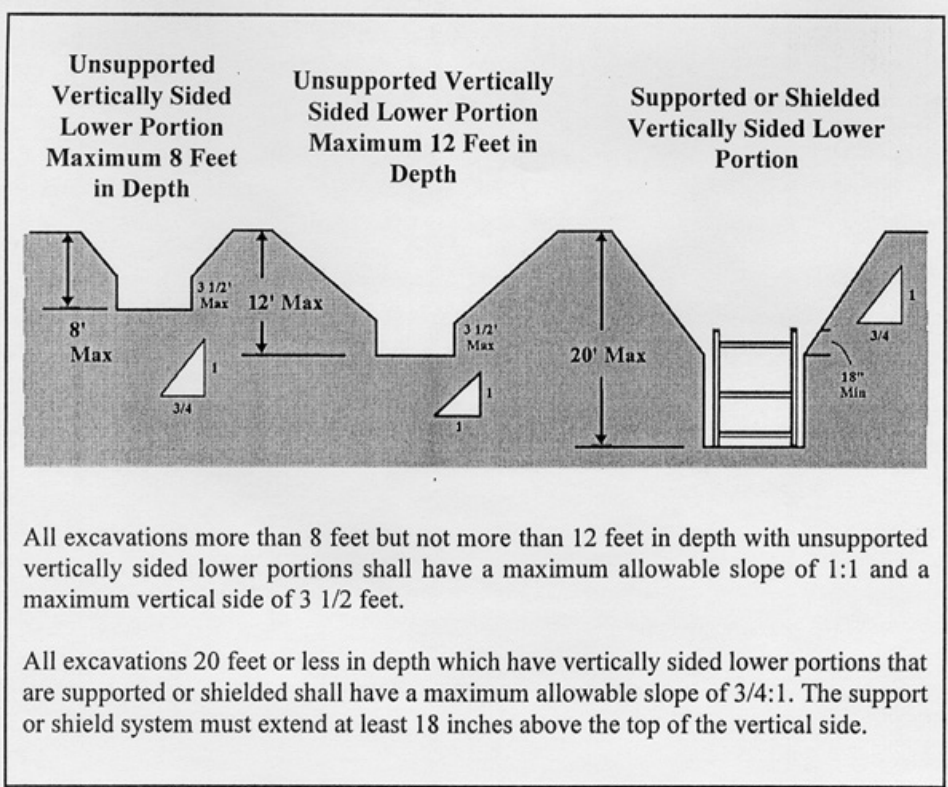


○ REPRESENT NUMBER OF STORIES

- ALL SURROUNDING BUILDINGS ARE SINGLE STORY
- ADJACENT TO A RESIDENTIAL NEIGHBORHOOD
- MINIMAL DAYLIGHT OBSTRUCTION (TREES ONLY)
- ~6' - 8' SLOPE IN EXISTING GRADE
- SITE CONTAINS TWO PARKING LOT ENTRANCES WHICH WILL ALLOW EASY ACCESS FOR EXCAVATION EQUIPMENT

EXCAVATION

SITE SECTIONS FOR 15' MAX EXCAVATION ON MAIN PARCEL



- IN ORDER TO EXCAVATE TO A 15' DEPTH, SUPPORTED (OR SHORED) VERTICAL SUPPORTS MUST BE UTILIZED.

-DEPENDING ON WHERE THE EXCAVATION IS PLACED IN RELATION TO THE PROPERTY LINE, A SLOPED

INFORMATION FROM OSHA SAFETY AND HAZARD REGULATIONS FOR CONSTRUCTION
SUBPART: EXCAVATIONS

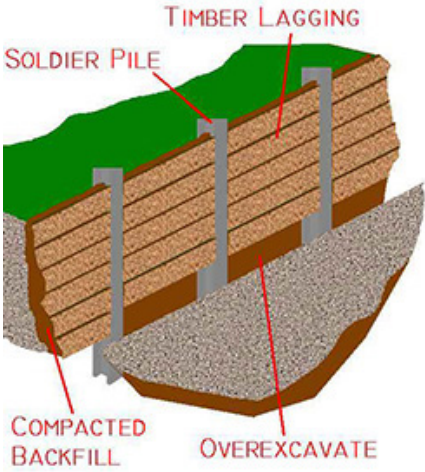
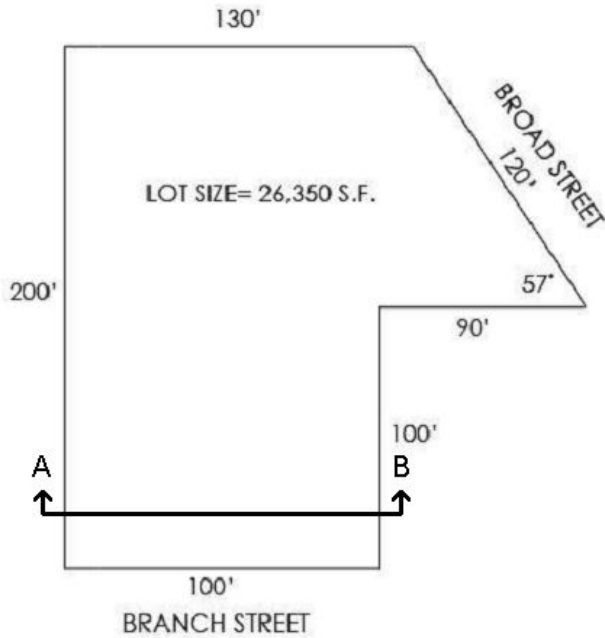


FIGURE 1. A COMMON EXCAVATION TECHNIQUE FEATURING TIMBER LAGGING AND STEEL PILES

EXCAVATION

POTENTIAL ISSUES AND CONSTRAINTS



VIEW FROM BROAD STREET

- ADJACENT BUILDING IS LOCATED VERY CLOSE TO EXISTING BUILDING. TAKE CAUTION DURING DEMOLITION.
- MULTIPLE TREES IN FRONT OF PROPERTY.
- MAJORITY OF PROPERTY IS PAVED.

APPENDIX

SOIL INFORMATION

-SOILS VALUES PER TABLE 18-1-A OF THE 1997 UNIFORM BUILDING CODE (UBC).

-Design values used in calculations:

Bearing	1000psf
Lateral Passive	100 pcf
Friction	130 psf
Equiv. Fluid Pressure	40 pcf
Expansion Index	126 (High)
Soil Classifications	Clay(CH)

-City inspector shall inspect and approve all grading and excavations prior to placement of forms, reinforcing steel or concrete.

-All footings to bear 27" minimum into natural grade.

1.5 Slabs on grade, where occur, shall be a minimum of 4" thick, underlain with 4" of clean sand, and with #4 @ 18" o.c. each way at mid-depth. Refer to the architectural for all finishes.

IBC Section 1804: Excavation, Grading, and Fill

1804.1 Excavation near foundations. Excavation for any purpose shall not remove lateral support from any foundation without first underpinning or protecting the foundation against settlement or lateral translation.

1804.2 Placement of backfill. The excavation outside the foundation shall be backfilled with soil that is free of organic material, construction debris, cobbles and boulders or with a controlled low-strength material (CLSM). The backfill shall be placed in lifts and compacted in a manner that does not damage the foundation or the waterproofing or dampproofing material.

1804.3 Site grading. The ground immediately adjacent to the foundation shall be sloped away from the building at a slope of not less than one unit vertical in 20 units horizontal (5-percent slope) for a minimum distance of 10 feet (3048 mm) measured perpendicular to the face of the wall. If physical obstructions or lot lines prohibit 10 feet (3048 mm) of horizontal distance, a 5-percent slope shall be provided to an approved alternative method of diverting water away from the foundation. Swales used for this purpose shall be sloped a minimum of 2 percent where located within 10 feet (3048 mm) of the building foundation. Impervious surfaces within 10 feet (3048 mm) of the building foundation shall be sloped a minimum of 2 percent away from the

1804.4 Grading and fill in flood hazard areas. In flood hazard areas established in Section 1612.3, grading and/or fill shall not be approved:

1. Unless such fill is placed, compacted and sloped to minimize shifting, slumping and erosion during the rise and fall of flood water and, as applicable, wave action.
2. In floodways, unless it has been demonstrated through hydrologic and hydraulic analyses performed by a registered design professional in accordance with standard engineering practice that the proposed grading or fill, or both, will not result in any increase in flood levels during the occurrence of the design flood.
3. In flood hazard areas subject to high-velocity wave action, unless such fill is conducted and/or placed to avoid diversion of water and waves toward any building or structure.
4. Where design flood elevations are specified but floodways have not been designated, unless it has been demonstrated that the cumulative effect of the proposed flood hazard area encroachment, when combined with all other existing and anticipated flood hazard area encroachment, will not increase the design flood elevation more than 1 foot (305 mm) at any point.

1804.5 Compacted fill material. Where shallow foundations will bear on compacted fill material, the compacted fill shall comply with the provisions of an approved geotechnical report, as set forth in Section 1803.

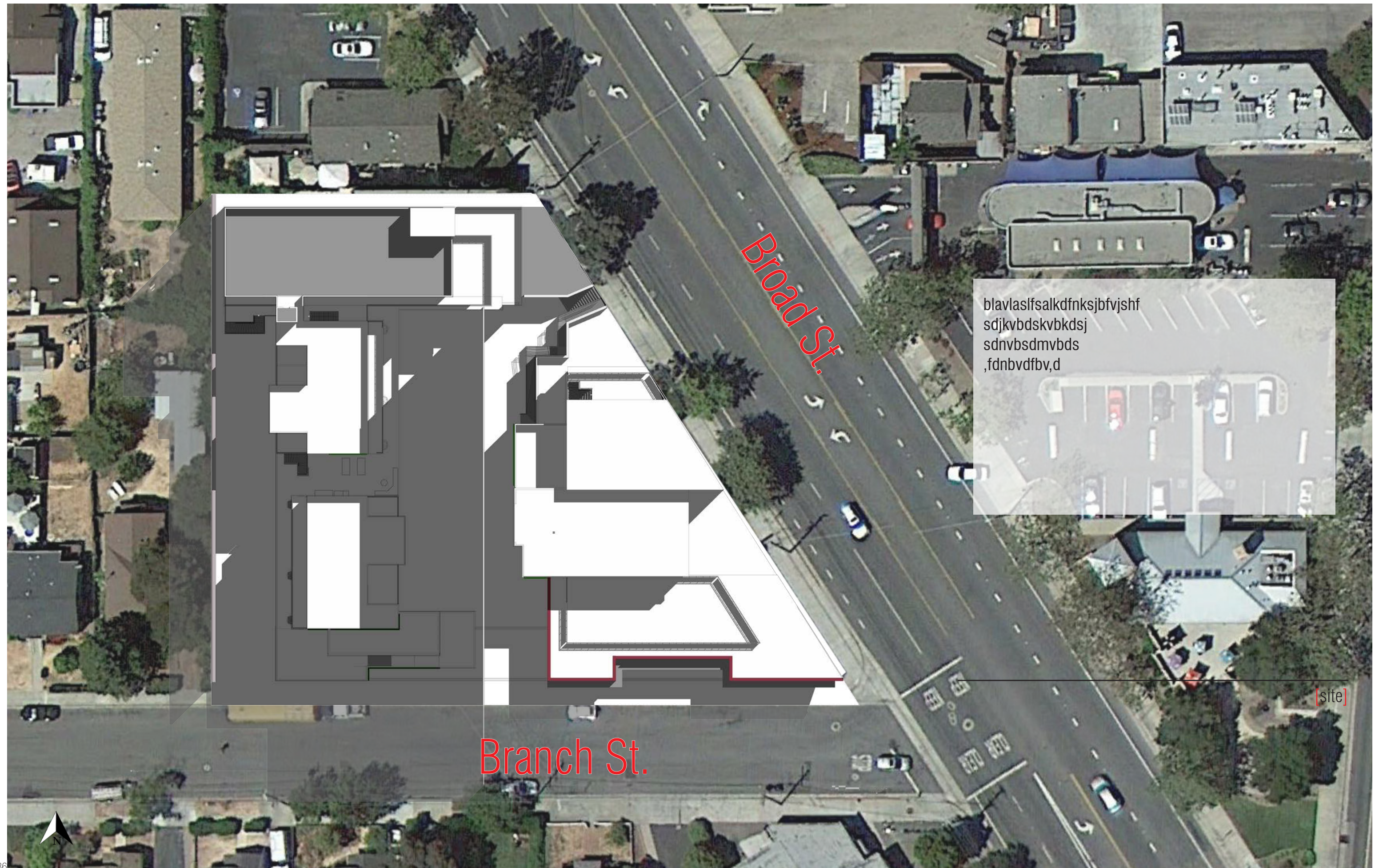
[program summary table]

	quantity	area (sq.ft.)
restaurant 1		2300
cafe 1		1700
office 1		2200
office 2		2000
grocery		3100
commercial parking	47	4400

	quantity	area (sq.ft.)
shared (enclosed)	2	1800
shared (open)	4	18000
studio unit	1	520
1 bedroom unit	5	600
2 bedroom unit	5	745
3 bedroom unit	10	1120
residential parking	20	1900



[project proposal]



Broad St.

Branch St.

blavlaslfsalkdfnksjbfvjshf
sdjkbvbskvbkdsj
sdnvbsdmvbs
,fdnbvdfbv,d

[site]





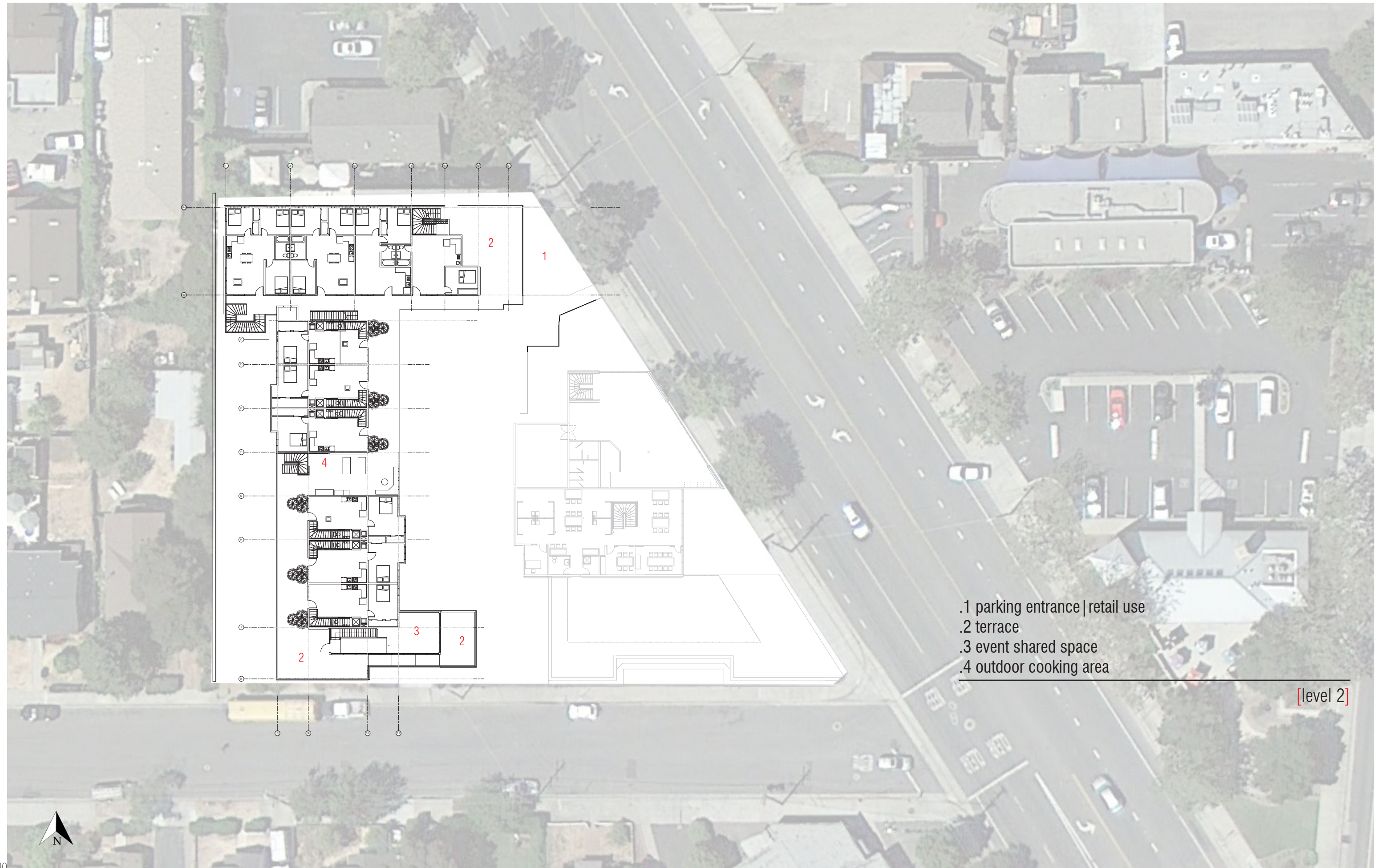
- .1 garden
- .2 lobby
- .3 office space
- .4 conference room
- .5 private office
- .6 restroom
- .7 shower

[level 1.3]



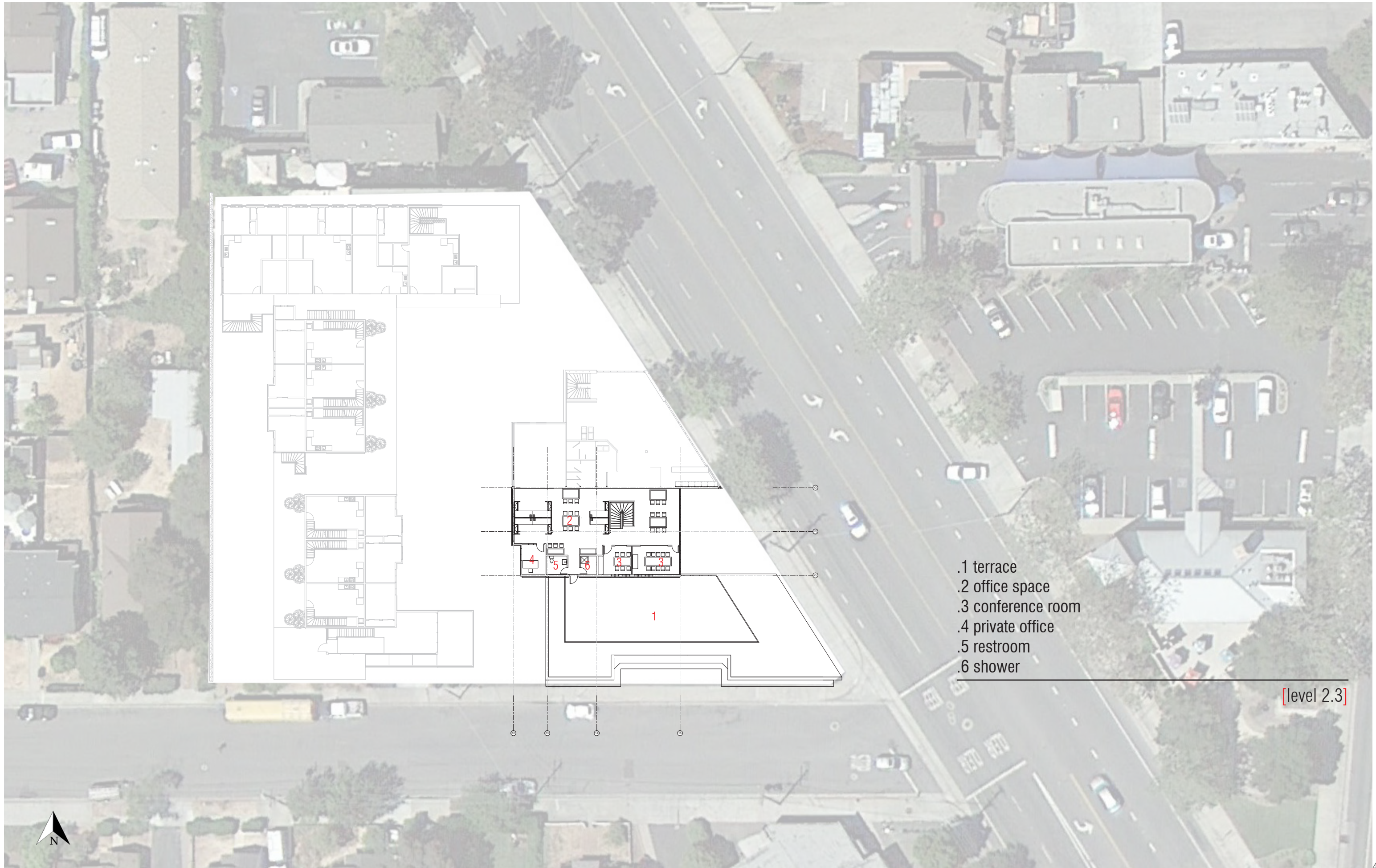
.1 restaurant/cafe
.2 back of house

[level 1.7]



- .1 parking entrance | retail use
- .2 terrace
- .3 event shared space
- .4 outdoor cooking area

[level 2]



- .1 terrace
- .2 office space
- .3 conference room
- .4 private office
- .5 restroom
- .6 shower

[level 2.3]





- .1 cafe
- .2 drink prep
- .3 terrace

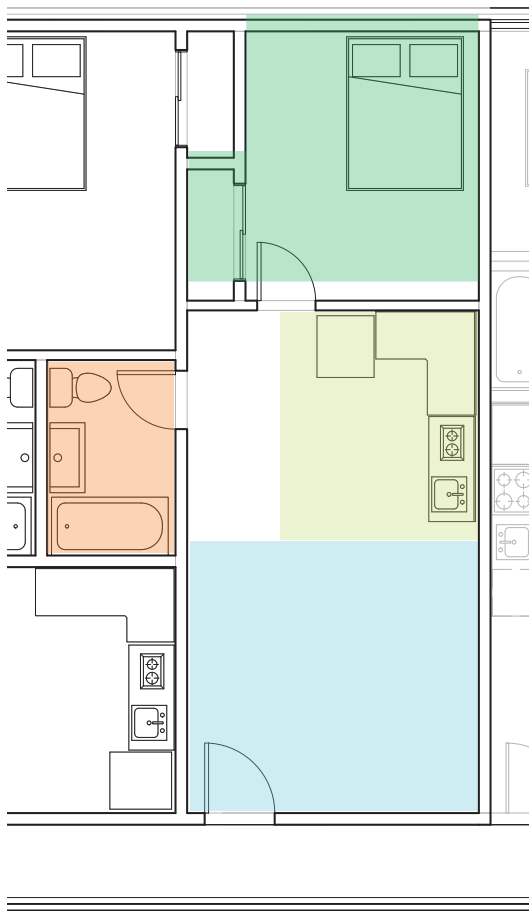
[level 2.7]



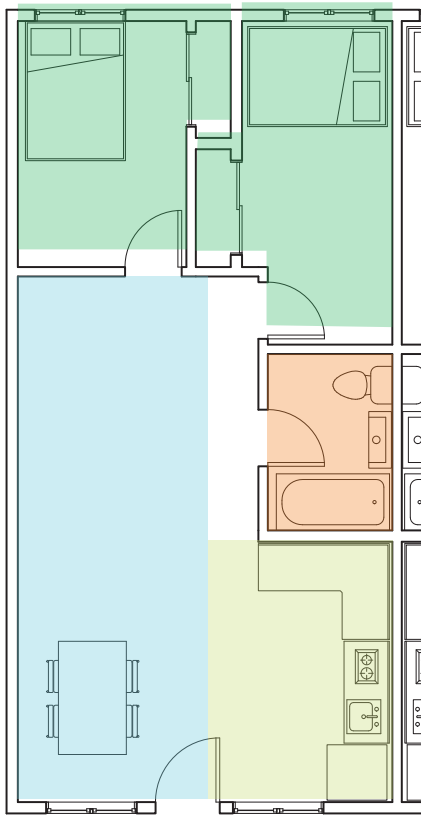
- .1 mechanical parking | retail use
- .2 courtyard
- .3 basketball court
- .4 mechanical | shared space

[level 3]

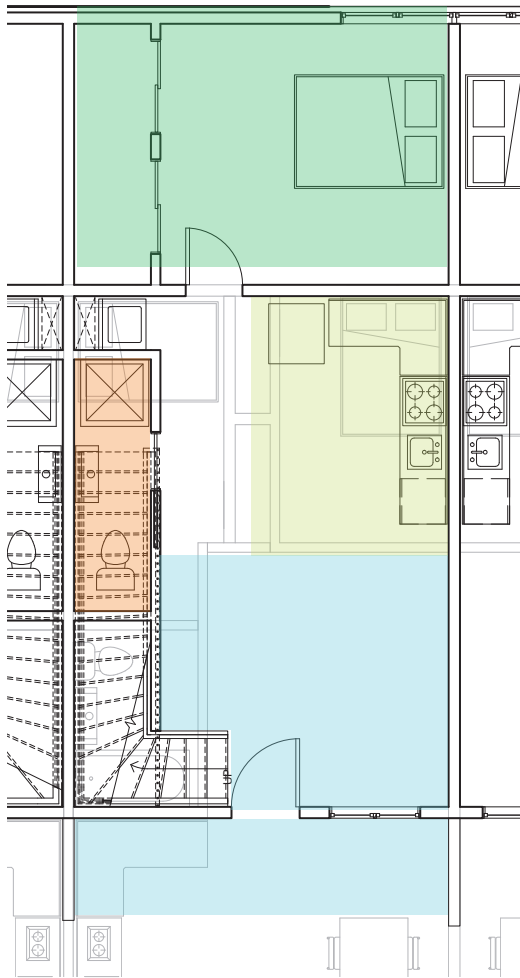
[unit layouts]



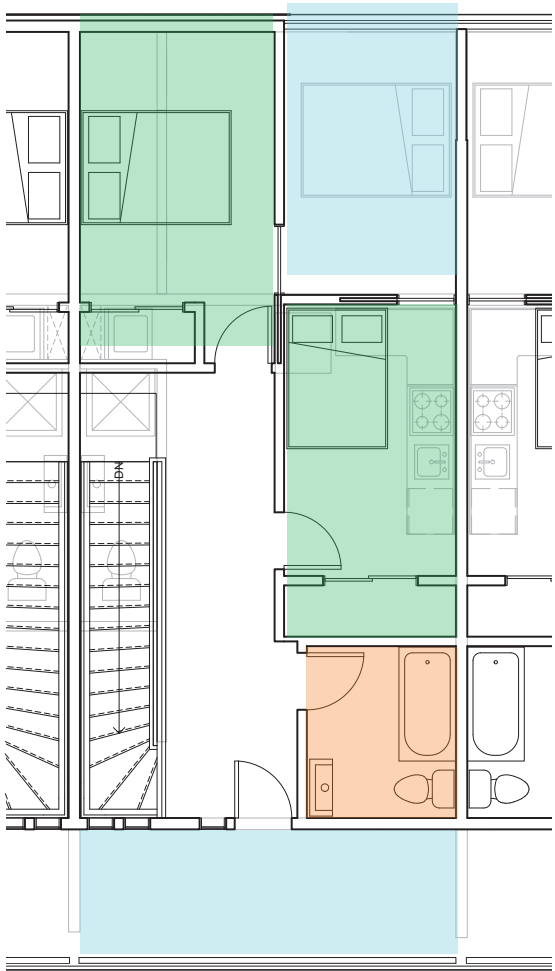
1 Bedroom



2 Bedroom

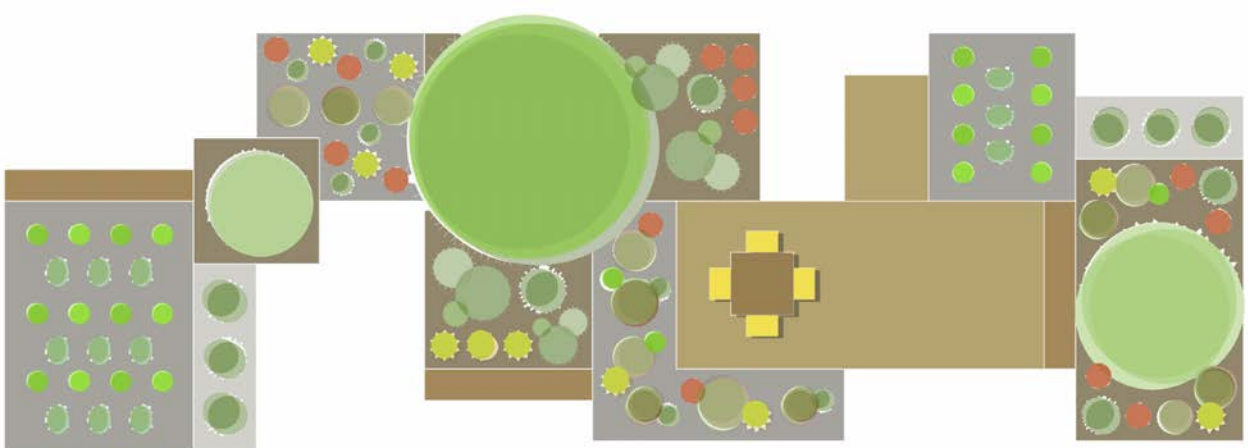


3 Bedroom

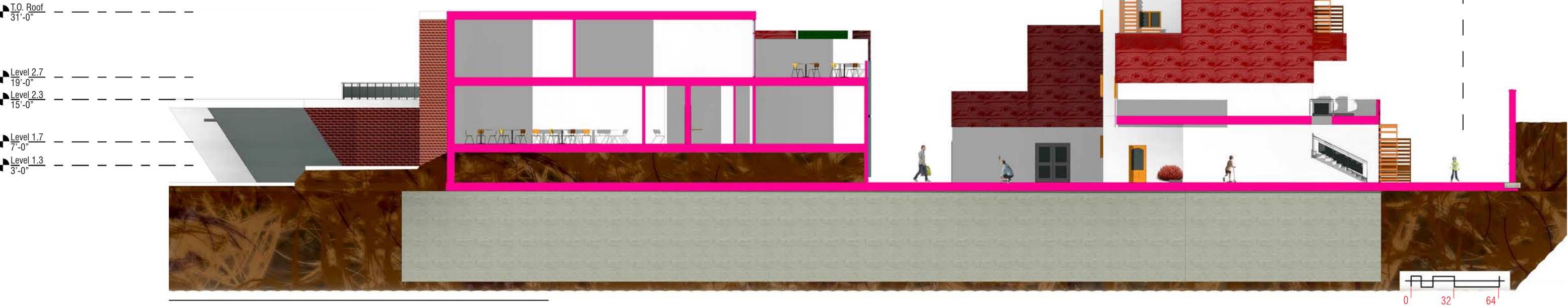


2nd Level

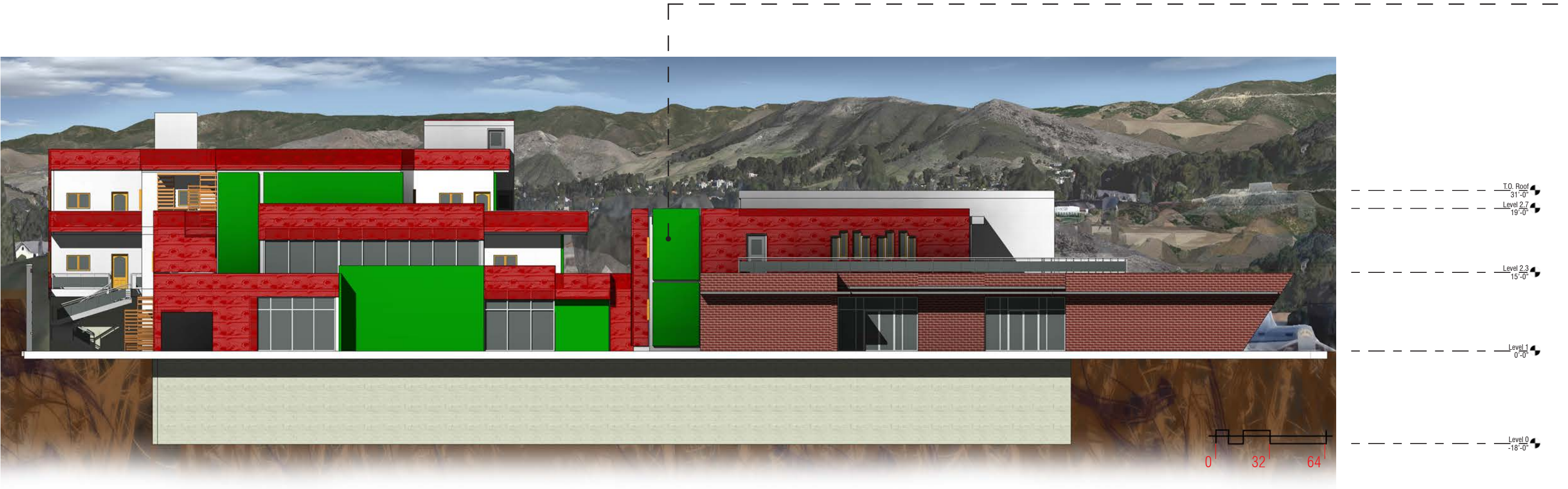
[section | courtyard south]



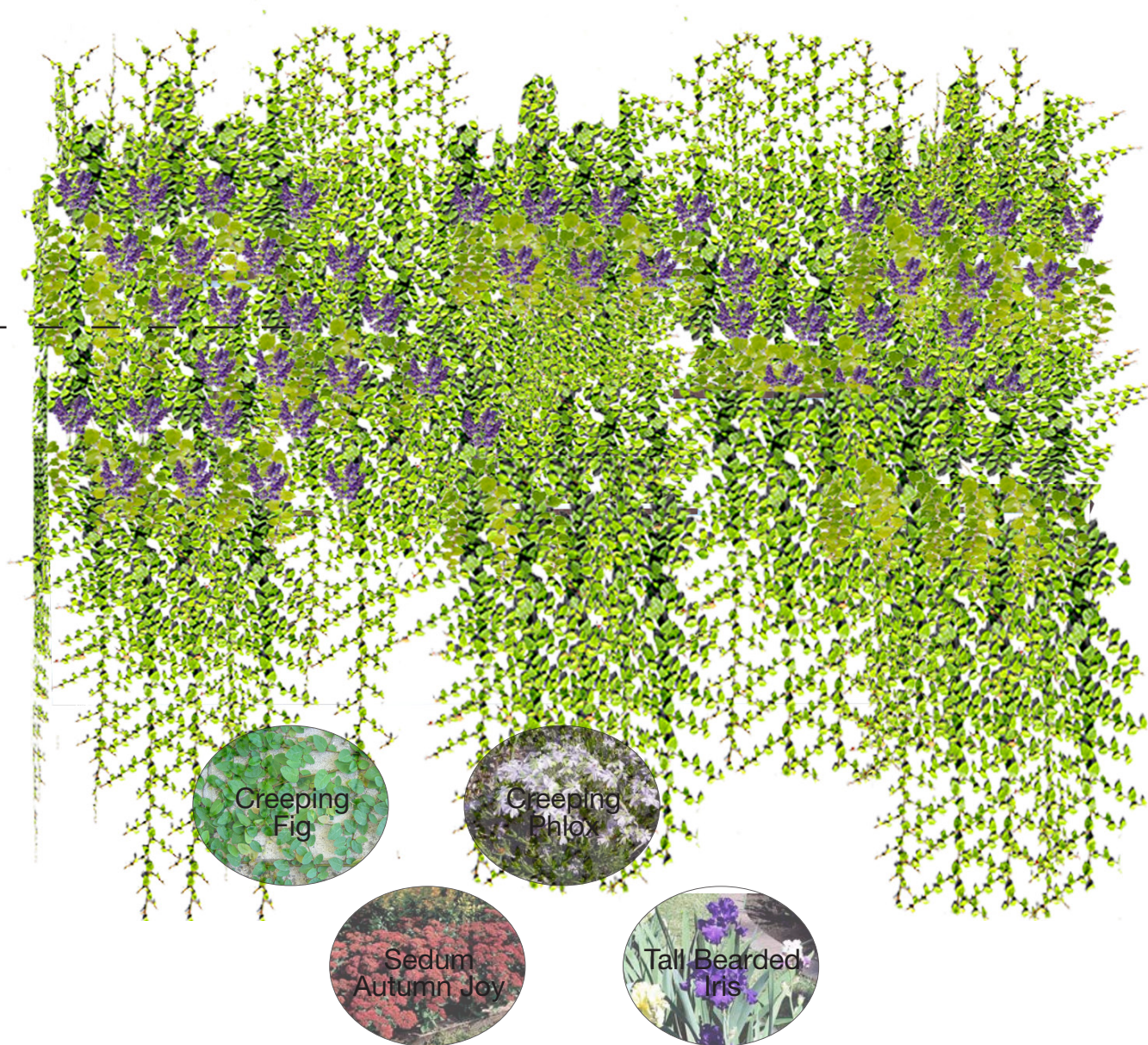
courtyard and community garden detail



[elevation | south]



[reservoir/green wall system]

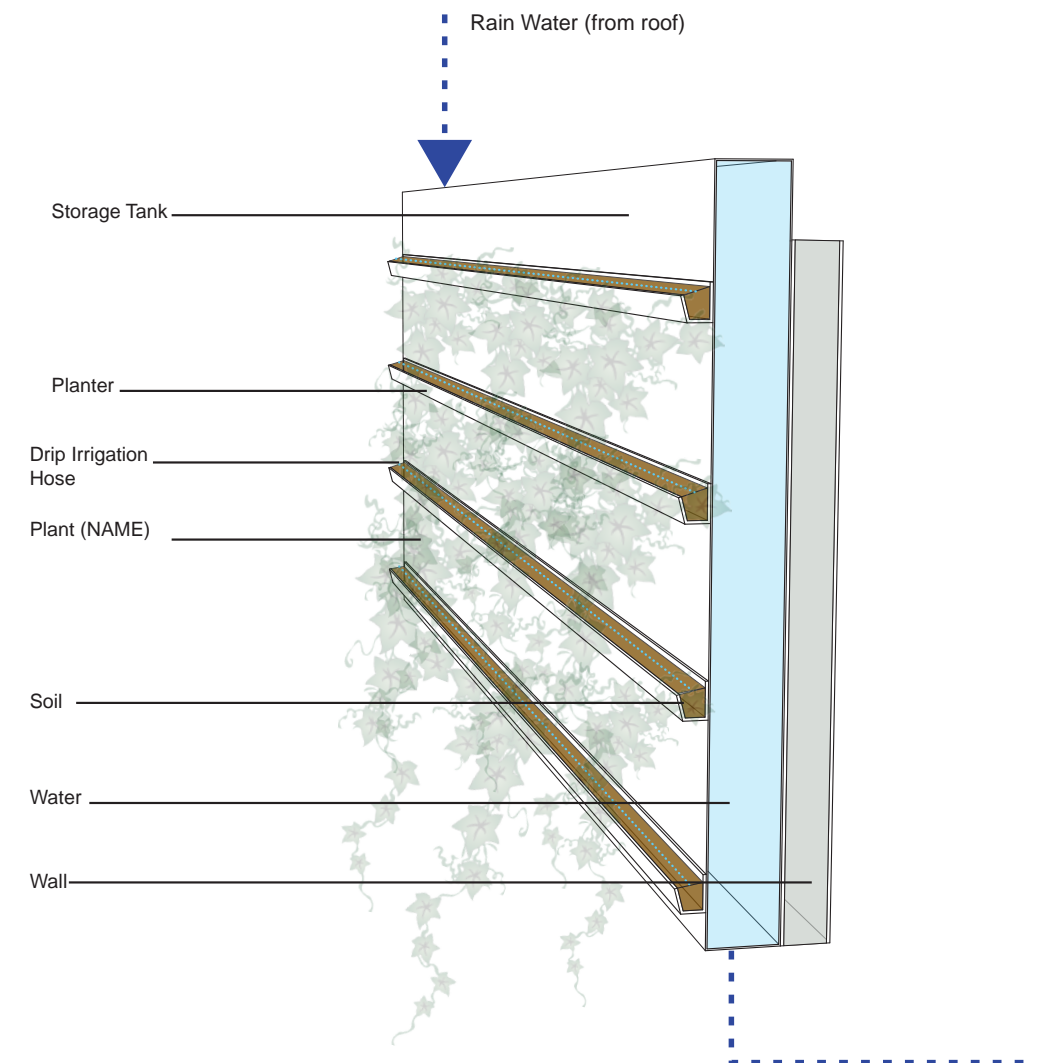


Planters provide support and the soil for a variety of plants

Low impact design allows for easy expansion

The chosen perennials are excellent choices for low-water gardening, and their hardiness makes them the perfect choice for a beautiful and low maintenance green wall.

Drip irrigation system that adjust to specific water levels and plant needs



[elevation | west]



[elevation | north]



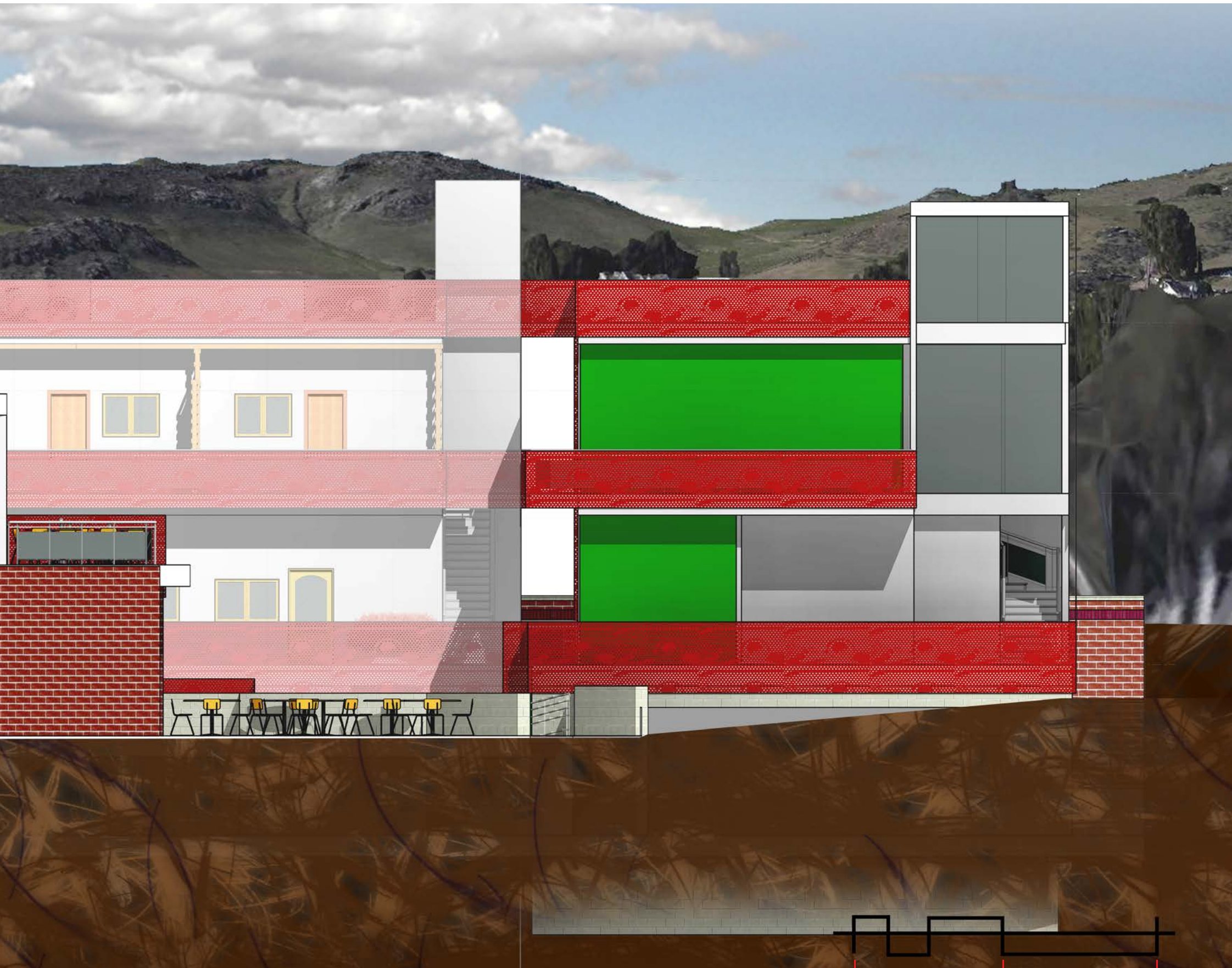




[section courtyard | west]

[elevation | broad st]





0

32

64

T.O. Roof
46'-0"

Level 4
36'-0"

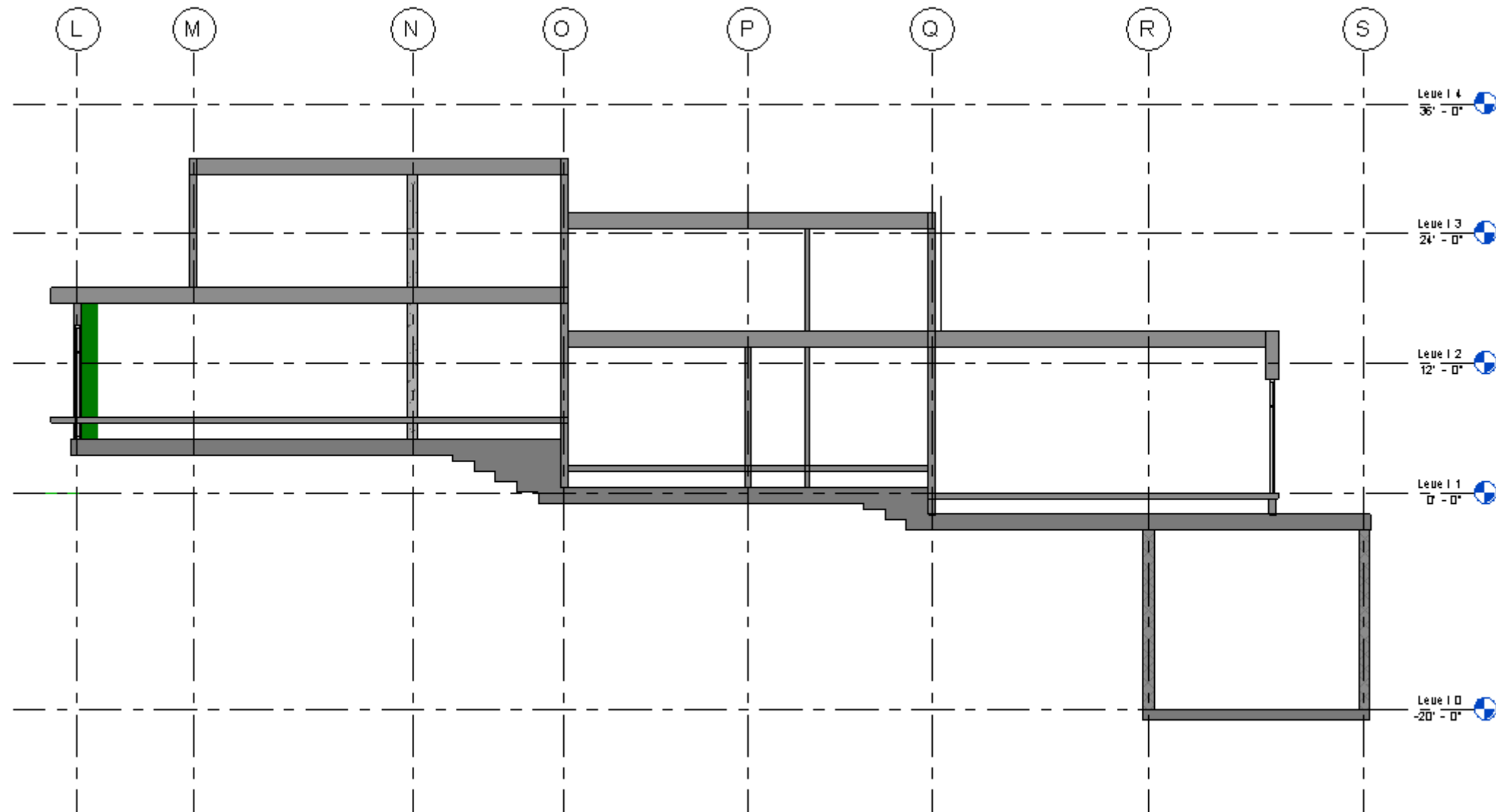
Level 3
24'-0"

Level 2
12'-0"

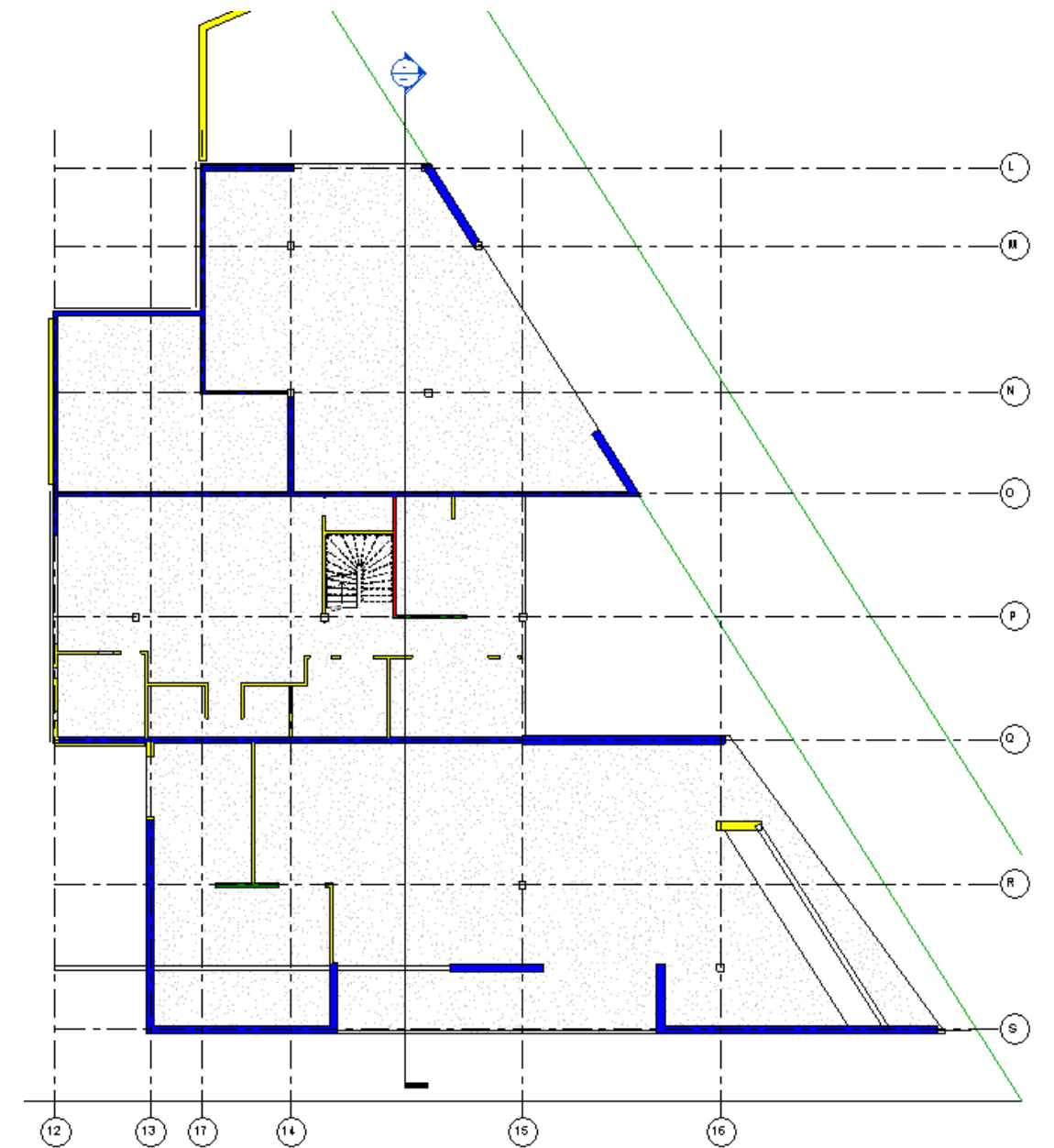
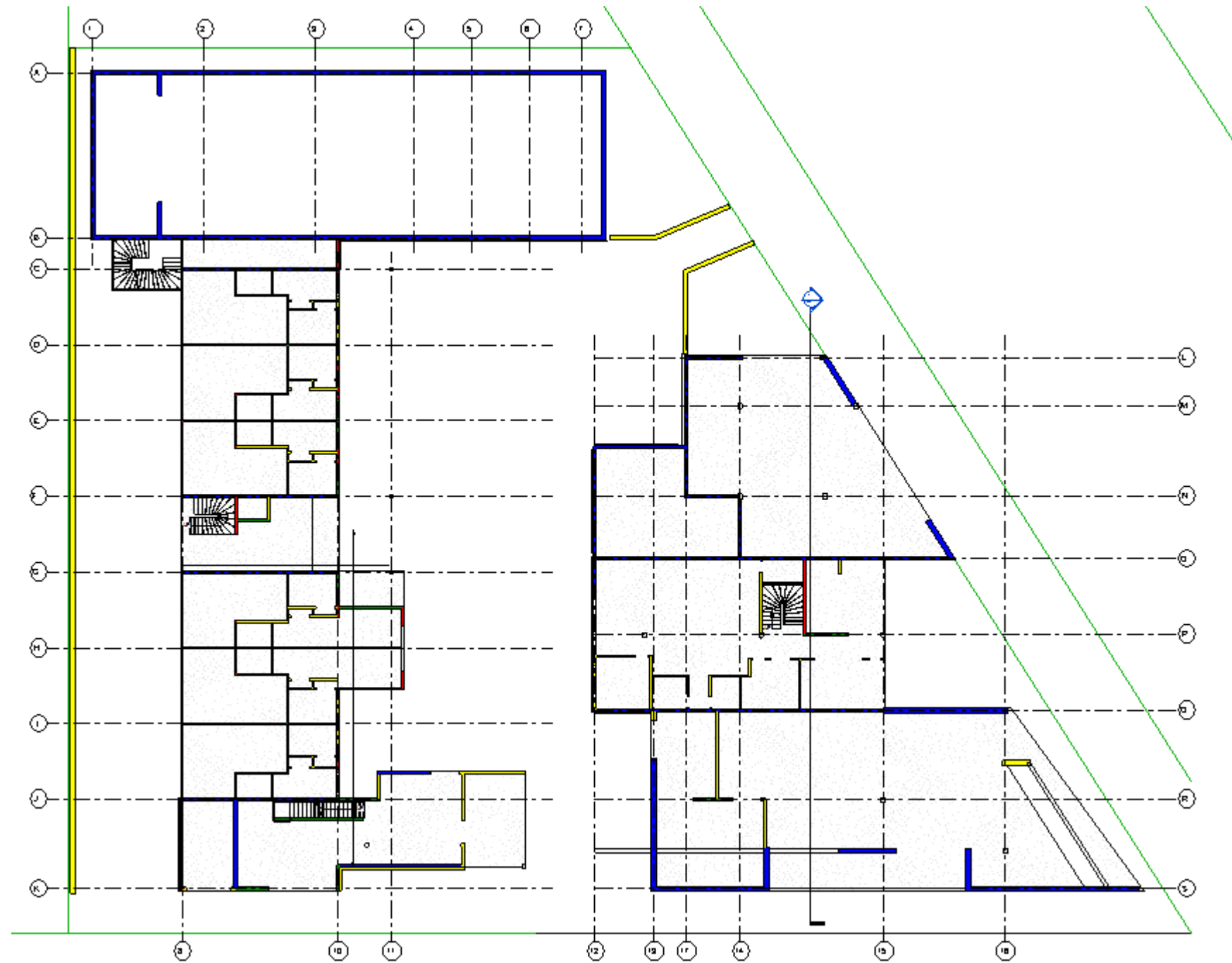
Level 1
0'-0"

[structure]

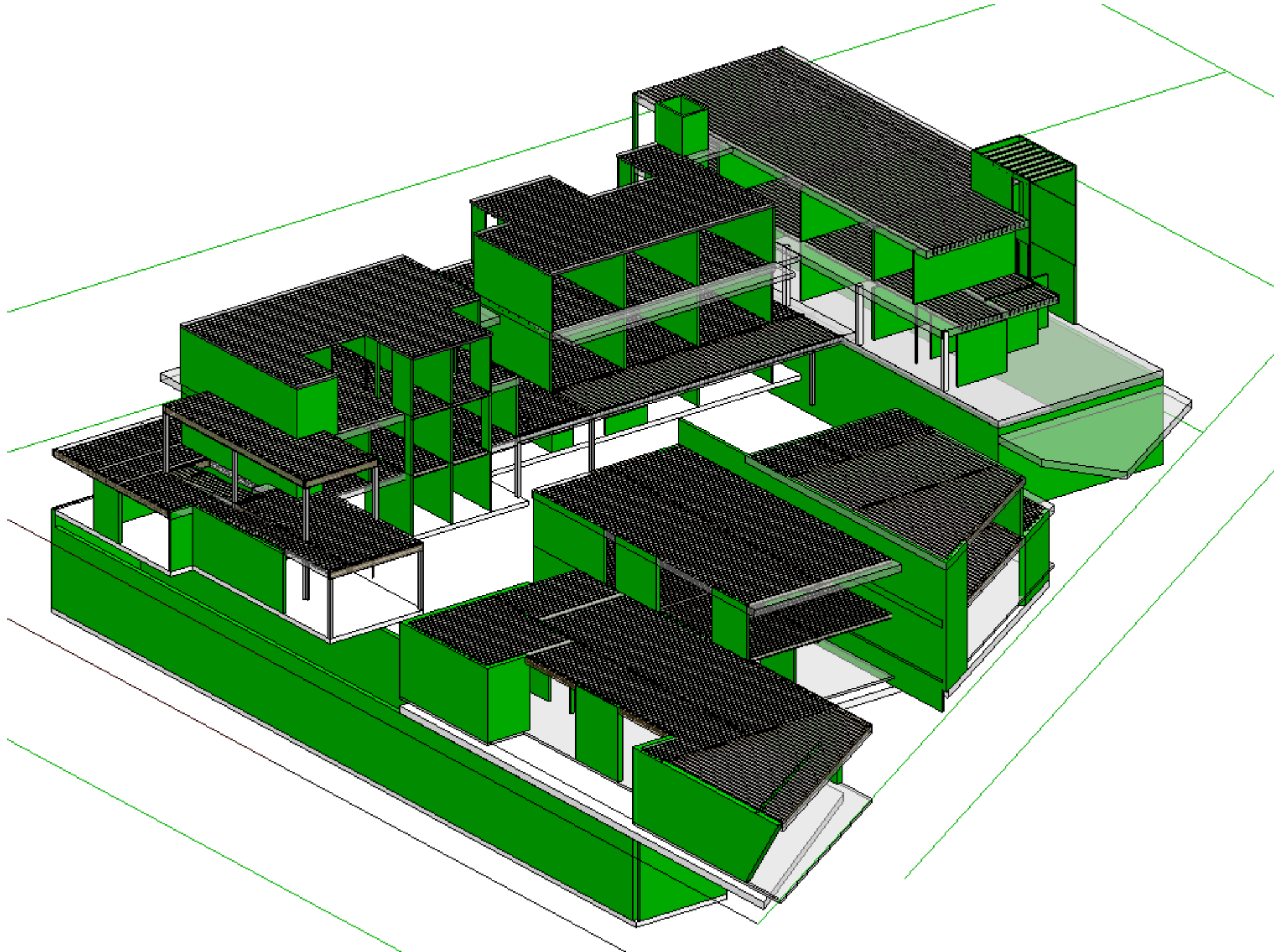
[foundation section]



[section location]



[gravity]



[lateral]

